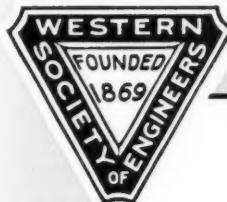


# MIDWEST ENGINEER



SERVING THE ENGINEERING PROFESSION



Water Contamination — Atomic Bomb Hits City "X" — Munitions Board

VOL. 1

OCTOBER, 1948

NO. 2

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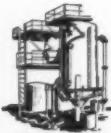
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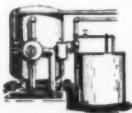
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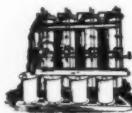
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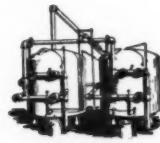
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Serving the Engineering Profession



October 1, 1948

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COVER CREDIT: City of Dayton, Ohio, Sewage Treatment Plant showing six final settling tanks. Sludge is removed from tanks through the use of Link-Belt Circuline Collectors. Photo courtesy of Link-Belt Company.

COMING IN THE NOVEMBER ISSUE:

STORY OF THE DIESEL  
 NEW YORK STOCK EXCHANGE  
 HOW A HAT IS MADE

# INDUSTRIAL PROBLEMS OF *Water Contamination*

Carl B. Carpenter<sup>1</sup> and W. W. Mathews<sup>2</sup>

Presented before a meeting of Western Society of Engineers, April 19, 1948

The information and data being presented herewith is intended as a general summary of the physical progress made to date within the Calumet area of Indiana in the efforts of certain Indiana municipalities and industrial plants with respect to the anti-pollution and anti-contamination program for the protection of Lake Michigan water. These Indiana municipalities in the Calumet region, along with specific industries in the area, each have a contributing part in the endeavor, which is preventive in scope and which has for its objective the public health protection of the several communities that share the use of Lake Michigan as a source of public water supply and for recreational purposes.

## City Sewage Programs

The first step in the Indiana Calumet region's contribution to the program was the organization of Sanitary Districts by the several larger cities in Lake County, Indiana, and progressively, the construction and operation of sewage treatment works by each of these municipalities.

The Gary Sanitary District constructed a complete sanitary intercepting sewer system and modern activated sludge type sewage treatment plant which was placed in operation in August 1940 to serve the entire City of Gary, excepting the Miller Community which is served by an Imhoff trickling filter plant.

In August 1941, the Hammond Sanitary District completed the construction and placed in operation a complete system of intercepting sewers and a new activated sludge type sewage treatment plant to serve the entire City of Hammond.

The East Chicago Sanitary District completed and placed in operation in September 1945 new sew-

age treatment works consisting of an intercepting sewer system and a plant of the Guggenheim design, to serve the entire City of East Chicago.

Since August 1944, the sanitary sewage originating in about two-thirds of the area of the City of Whiting has been delivered to the Hammond sewers and has received treatment in the Hammond plant. The City of Whiting has prepared the necessary plans and expects to advertise for bids this month for the near future construction of the facilities necessary to deliver the remainder of the sanitary sewage originating within the City of Whiting to the Hammond Sanitary District for treatment.

In February of this year, the Town of Munster, having an area of about ten square miles, was annexed to the Hammond Sanitary District. Plans and specifications are now in preparation for an intercepting sewer as well as a pumping station and appurtenances, required to deliver the Munster sanitary sewage to the Hammond sewer system for treatment. It is anticipated that this construction will proceed as rapidly as legal requirements will permit.

## The Industrial Problem

The second step in the overall program relates to the work being carried out by Calumet region industries. The Calumet region of Indiana, with some 150 principal industrial plants employing about 100 thousand people, is one of the most highly industrialized areas in the country. Within this area are located the largest steel mills and the largest single oil refinery in the world. In addition to other large steel mills, oil refineries, steel products plants, foundries and railroad equipment manufacturing plants, other large industries within the area include chemical manufacturers, metal refineries, soap works,

food products plants, and many other diversified industries.

The wide variation in the type and characteristics of the industrial wastes originating in the area, as well as some indication of the potential complexities of treatment methods, can best be illustrated by listing some of the manufactured products. In addition to basic steel, steel products, gasoline and petroleum products, ferrous and non-ferrous metal products, these include industrial alcohol, drugs, candy, soaps and soap products, edible oils, heavy chemicals, paper products, gypsum products, Portland cement, and corn products including starch, syrup and glucose.

In a great number of instances, those industrial wastes which are readily amenable to treatment in municipal sewage treatment plants are now being delivered, or will be delivered to the municipal works for treatment. In many industrial plants, the solution of waste treatment methods has been further complicated by the need for separating sanitary sewage from plant effluents. In the group of industrial plants as a whole, the work consists of either providing for the separate collection and disposal of sanitary sewage, or for industrial waste treatment, or for processing changes; or a combination of two or more of these.

## Three Main Classifications

For the purpose of this report, the present program of the several participating industrial plants is divided into three general classifications of construction, which are described as follows:

- (a) The construction of sanitary sewage systems, so arranged as to collect all the sanitary sewage originating within the respective industrial properties and to deliver this sewage to the city sewer system for treatment; or in

1. Superintendent of Hammond Sanitary District  
2. Superintendent of Gary Sanitary District

limited instances, after collection as described, to deliver the sewage to approved sewage disposal works, also constructed by the industry.

- (b) The construction and installation of industrial waste treatment facilities.
- (c) The revisions of plant processing facilities.

#### Individual Projects

The information which follows is intended to outline in a general manner the details of the foregoing with respect to individual industrial plants. This information is not necessarily complete and the estimated costs and quantities are approximate only. The information is presented for the purpose of defining the character and general magnitude of the work as applying to the part of each industrial plant in the overall program.

#### GARY PROJECTS

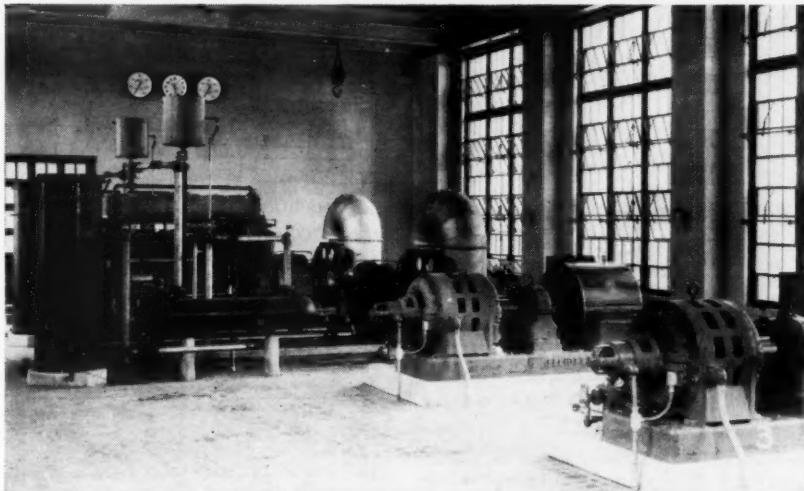
##### American Bridge Company

The work at the American Bridge Company plant consisted of intercepting the sanitary sewage and in some cases separating it from storm water flow. New branch sewers were constructed to reach the interceptor which carried the flow to a sewage pumping station built just northwest of the Bridge Street bridge. A force main is carried south across the Grand Calumet River under the Bridge Street bridge and thence to the trunk sewer in the alley west of Bridge Street. Discharge into this sewer is just behind the weir in the regulator chamber which diverts sewage to main interceptor of the Gary Sanitary District. The pumping station and intercepting sewer of the American Bridge Company went into service on August 20, 1945.

Total footage in sewer completed ..... 4.2 miles  
Amount expended on above and pumping station ..... \$42,000.00

##### Elgin, Joliet and Eastern Railway Company

The work to be done by the Elgin, Joliet and Eastern Railway Company consists of building a sewer system and pumping station to discharge sanitary sewage into the main interceptor of the Gary



**Blower Room, Gary, Indiana Sewage Treatment Works. One 7000 and one 9000 CFM Elliot Co. Motor Driven Blowers and two Roots-Connersville Positive Displacement Blowers driven by 300 H.P. Copper-Bessemer Gas Engines.**

##### Sanitary District at Buchanan Street.

Total footage of sewer being laid

..... 2,200 feet

One sewage lift station

Estimated cost of above

..... \$41,000.00

Completed as of April 1, 1948

..... 60%

Estimated date of completion—  
latter part of 1948

##### Gary Sheet and Tin Mill

The Gary Sheet and Tin Mill occupies a large area which necessitated laying approximately 5.3 miles of sanitary sewer with one pumping station. The flow from this system will be discharged into the Gary sewer at Buchanan Street.

Total footage of sewer being laid

..... 28,000 feet

One sewage lift station

Estimated cost of above

..... \$525,000.00

Completed as of April 1, 1948

..... 75%

Estimated date of completion—  
October 1, 1948

##### Carnegie-Illinois Steel Corporation

The Carnegie-Illinois Steel Corporation is the largest industry in Gary and includes the coke plant sewer system. Due to the large area covered and connections required to numerous buildings, more sewer is being laid than by any other industry. Construction work on all United States Steel Subsidiaries was started in 1947 but shortage of materials and manpower kept construction from going ahead

at a rapid rate. In this system 280 live railroad tracks were crossed and 30 permanent roads. At times subsurface obstructions were encountered which hindered progress of the work.

Total footage of sewer being laid  
—14.2 miles (2.2 miles of 24" force main)

1 Main pumping station and 9 sewage lift stations discharging to Main pumping station.

Estimated cost of above

..... \$1,400,000.00

Completed as of April 1, 1948

..... 20%

Estimated date of completion—  
Latter part of 1948

##### National Tube Company

The National Tube Company cannot reach the Gary interceptor without constructing a long discharge line which would entail marine work crossing the Grand Calumet River. Arrangements were made to discharge into a manhole on the Carnegie-Illinois Steel Corporation sewer system. One pumping station is required to lift the sewage into the manhole and a suction well is designed with this station which will permit discharge at a uniform rate to avoid peak loading of Carnegie-Illinois branch sewer.

Total footage of sewer being laid  
..... 9,000 feet

1 Sewage lift station

Estimated cost of above

..... In excess of \$150,000.00

*(Continued on Page 4)*

## PROBLEMS IN AVOIDING

# Water Contamination

(Continued from Page 3)

Completed as of April 1, 1948....

..... 95%

Estimated date of completion—  
Latter part of 1948\*

### Gary Screw and Bolt Division

In addition to the sanitary sewers being constructed by the industries noted heretofore the Gary Screw and Bolt Division is constructing new sewers and installing a treatment plant for the recovery and partial reclamation of oil now being discharged into the Gary Sewer System. This improvement has no connection with the Illinois suit but since the expenditure for this work is being made during 1948, a report on this work is included in this paper.

Field surveys showed that about 125 gallons of oil per day was carried out of the plant with the sanitary sewage. This oil interfered with the operation of the Gary Activated Sludge Plant. Oil coated suspended solids would float instead of settling, and the biological processes were inhibited. Gas production would decrease at times to 50 per cent of normal on account of oily sludge being pumped to the multi-digestion system.

Engineers were engaged by the industry to make a study and determine the changes and facilities required to remove the oil from the plant wastes which were being discharged to the Gary sewers. The problem was complicated by the different types of oil being used in the manufacturing process which in general included soluble and non-soluble oils, cutting and lubricating oils and quenching oil. These oils all discharged into a common outlet and mixed with sanitary and storm water flow from the plant.

Summarizing briefly the recommendations of the engineers were as follows:

1. To modify the existing sewer system by diverting all sanitary and storm flows untreated to the Gary sewer system which would carry no oil.

\*Carnegie-Illinois sewer system must be in operation before National Tube Company system can be used.

2. To provide a waste treatment plant for the balance of plant flows to remove the oil before discharge to city sewers.

To accomplish the above it is necessary to change downspouts, lay new sewers and to construct a Gravity Differential Separator. This type of oil removal plant has been developed through extensive research and tests by the American Petroleum Institute. In addition to the above, wastes from parts of the equipment requires chemical treatment. As noted above the Gary Screw and Bolt Division has a complicated industrial waste problem to solve and expects to let contracts shortly and to have the plant in operation the latter part of this year. Estimated costs of the project will range between \$50 thousand and \$60 thousand.

### HAMMOND INSTALLATIONS American Maize Products Company

Since early in 1943, all the sanitary sewage originating within the American Maize Products Company plant has been delivered to the city sewer system for treatment by the Hammond Sanitary District. The company is presently engaged in a construction program, involving extensive reprocessing changes and improvements, in order to effect reduction of volume and concentration of plant wastes, so that the same may be accepted for treatment by the Hammond Sanitary District. The improvement which in effect involves the utilization of complete "bottling up" methods, is intended to eliminate all unfavorable characteristics of plant effluent being discharged into Lake Michigan, with the exception of approximately 300 pounds of corn sugar per day. This corn sugar will combine with some ten to fifteen MGD of indirect process waters discharged into Lake Michigan. Upon completion of the construction program, approximately 0.3 MGD of plant waste, having an equivalent population of 14 thousand persons, will be delivered to the Hammond sewer system for treatment by the Hammond Sanitary District.

The overall improvements in the plant, not including the sanitary sewers previously constructed, are estimated to cost about \$800 thousand. To date, a little more than 50 per cent, of the required equipment has been installed and placed in operation. An additional approximately 40 per cent of the equipment required has been delivered and is in process of installation. Delivery is being awaited on some of the remainder of the equipment and it is anticipated that the new improvements will be in complete use by November 1948.

### WHITING PLANTS Standard Oil Company

The project of the Standard Oil Company at Whiting, now nearing completion, is by far the largest single endeavor of its kind among the several Calumet region industrial plants which are participating in the overall construction program that is designed to protect Lake Michigan water. The Standard Oil Company work includes:

- (a) The installation of a separate sanitary sewer system, involving about 10.5 miles of pipe ranging in size from 4 to 20 inches in diameter and 11 sewage ejector or pumping stations.
- (b) Additions to the existing process water sewer system, comprising about three-fourths miles of intercepting sewers, which consists mainly of 36 inch and 96 inch diameter pipes.
- (c) A new oil separation system having a volumetric capacity of 110 MGD and consisting of 34 units of modern A.P.I. design, along with mechanical bar screens, piping, a pumping station, emulsion treating tanks and appurtenances.

All sanitary sewage originating within the refinery property will be delivered to the Whiting sewer system. All direct process wastes are to be conducted to the new oil separation system. All spent cooling water will be directed to an existing oil separation system which has a volumetric capacity considerably in excess of the cooling water quantities actually handled.

The sanitary sewage system and

the additions to the direct process water sewer system are estimated to cost about \$3 million. The estimated cost of the new oil separation system is about \$3 million.

At the present time the overall project is reported as being about 85% completed. Most of the sanitary sewers have been laid and the several pumping stations are in process of completion. It is estimated that the entire sanitary sewer system will be in complete operation by October 1948. All of the process water intercepting sewers have been completed and it is now anticipated that the new oil separation system will be completed and placed in operation late this year.

#### **Carbide and Carbon Chemical Corporation**

Improvements completed at this Whiting plant, which have been in operation since May 1947, include a separate sanitary sewage system which is arranged to collect all the sanitary sewage originating within the plant property and to deliver the same to the Whiting city sewer system at Front Street; also the construction and installation of a closed water system for the purpose of controlling specific direct process waste waters.

Total footage of sanitary sewers laid..... 2,000 feet

Estimated cost of sanitary sewer system..... \$85,000

Estimated cost of closed water system improvement..... \$100,000

#### **EAST CHICAGO PLANTS** **Rogers Galvanizing Company**

The work being done at the Rogers Galvanizing Company plant consists of the installation of a gravity sanitary sewer system arranged to deliver sewage to the City of East Chicago sewer in Indianapolis Boulevard; also the construction of a small acid neutralization system. All the work is under contract.

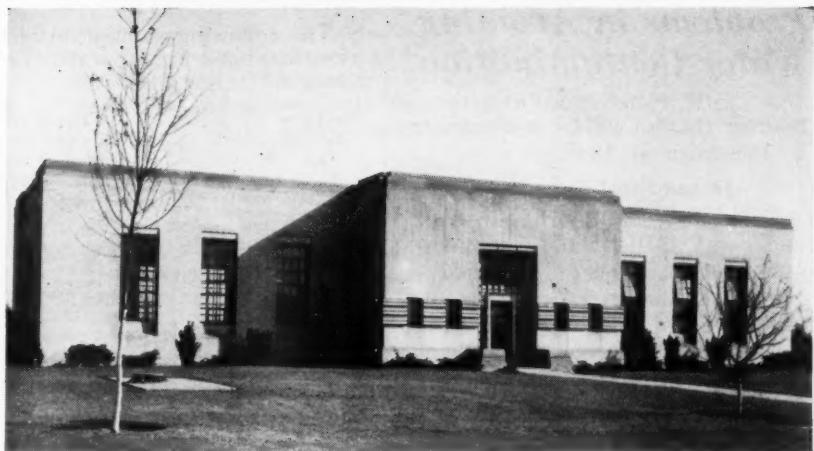
Total footage of sewer being laid..... 630 feet

Estimated cost of sewers and neutralization system..... \$15,000

Estimated date of completion—July, 1948

#### **E. I. DuPont de Nemours and Company, Inc.**

#### **Grasselli Chemicals Department** This industrial plant, located in



**One of the outlying pumping stations of the Hammond Sanitary District located at Kennedy Avenue & Michigan Street.**

East Chicago, completed the installation of a separate sanitary sewer system, which has been in operation since June 1947. This system, which consists of about 11,500 feet of 8" diameter pipe, 1500 feet of 6" diameter pipe, 50 manholes and three (3) pumping stations arranged to collect all the sanitary sewage originating at some 43 separated points over the plant property and to deliver the same through about 900 feet of 8" transite pipe pressure sewer to the city sewers of East Chicago. The system was constructed at a cost of approximately \$200 thousand.

#### **Sinclair Refining Company**

In order to prevent any possible pollution of receiving water, the construction program covering the modernization of the Sinclair Refinery at East Chicago, Indiana, includes the complete separation of sanitary sewage from refinery effluent, the reduction in the total volume of refinery effluent to a quantity equivalent to about one-tenth of the former volume, as well as extensive plant processing revisions and improvements; all for the purpose of effecting the most favorable characteristics of refinery effluent and for controlling the same with respect to local receiving bodies of water. No refinery effluent will be permitted to discharge into the receiving body of water without first being specifically treated.

A separate sanitary sewer system, which collects all the sanitary sewage originating within the refinery property and delivers the same to the East Chicago city sew-

er system has been in use since June 1945. The refinery construction designed to provide the improvements in refinery effluent described above includes the following:

- (1) A multiple cooling tower system to handle all cooling and condenser water and thus to reduce the refinery effluent from approximately 33,000 gpm to approximately 3,000 gpm.
- (2) The installation of light oil clarifiers, which along with modifications of both the design and the operations of the light oil treating plant will eliminate the wash water formerly used by the plant.
- (3) The installation of a modern A.P.I. oil separator, in addition to an existing oil separator.
- (4) The installation of a spent caustic disposal system.
- (5) The construction of a new lube oil treating plant.

At this time it is impossible to state the cost of the overall program but it is estimated that such costs will be about \$800,000, exclusive of the cost of any part of the new lube oil treating plant. Of this estimate, \$73,000 has been expended for the sanitary sewer system, consisting of some 14,000 lin. feet of pipe and 6 sewage ejectors or pumping stations. The overall improvement is now more than 70 per cent completed and it is anticipated that the remaining units will be completed progressively in such

*(Continued on Page 6)*

## Problems in Avoiding Water Contamination

(Continued from Page 5)

manner that all will be in operation by December 31, 1948.

### Inland Steel Company

The construction program now under way at the Inland Steel Company plant provides for the separation of sanitary sewage from cooling water and other wastes and the collection and treatment of the sanitary sewage. This involves the construction of nearly nine miles of cast iron pipe sewers, thirty-one sewage ejector or pumping stations and a sewage treatment plant. The sanitary sewage is to be collected from some 200 separated sanitary installations within the plant property.

The new sewage treatment plant consists of a main pumping station, preliminary settling tank of the two-story or Imhoff type, trickling filters, final settling tank and chlorination facilities. Provisions are made for returning final settling tank underflow to the preliminary settling tank and for maintaining minimum flows to this latter unit and to the trickling filters. Digested sludge will be burned in the blast furnaces. The treatment plant effluent will be discharged into an existing 72 inch sewer which ultimately conveys large quantities of cooling water and other process waste waters to the harbor.

The sewage treatment plant is completed. Construction of remaining portions of the collection system is scheduled so that the treatment plant can be placed in operation shortly after its completion and additional connections made as the installation of sewers progresses.

A summary of the project, as well as progress to date is as follows:

Total footage of sewer being laid.....	47,000 feet
Number of sewage ejector stations.....	31
Estimated Cost:	
Sewage treatment plant .....	\$ 250,000
Sewerage system....	1,150,000
Total.....	\$1,400,000

The following tabulation is indicative of the extent of sewage treatment services presently being carried out by the Lake County, Indiana Sanitary Districts.

Sanitary District of	Costs of Sewage Treatment Works Installed	Estimated Connected Human Population Served	Equivalent Population of Sewage Treated	Area Served Sq. Miles
GARY	\$4,372,000	100,000	153,100 #	41.5
HAMMOND	\$3,250,000	80,000*	181,300 #*	24.3*
EAST CHICAGO	\$2,277,000	60,000	44,700†	11.0
TOTALS	\$9,899,000	240,000	379,100	76.8

\* Includes part of the City of Whiting

# Average 1947

† Average October 1947 to February 1948

Completed as of April 1, 1948  
 Sewage Treatment Plant 85%  
 Sewers and pumping stations ..... 10%  
 Estimated final completion date, July 1949

### Socony Vacuum Oil Company

The Socony Vacuum Company Refinery in East Chicago is engaged in the construction of a sanitary sewerage system, which upon completion will collect all sanitary sewage originating within the refinery property at some 25 separated sanitary toilets and wash rooms over an area of about 80 acres and will deliver the sewage to the East Chicago city sewer system for treatment.

Total footage of sewer being laid ..... 6,000 feet  
 One two (2) pump lift station  
 Estimate overall completion to date, approximately ..... 90%  
 Estimated date of completion—October 15, 1948

### Cities Service Oil Company

Since the time of the original construction of the East Chicago refinery, the Cities Service Oil Company has operated a separate sanitary sewerage system, arranged to serve the entire property and to deliver all sanitary sewage originating therein to the East Chicago city sewers. Accordingly, the current construction program at this plant is aimed entirely towards the control of the characteristics of the refinery effluent. This last is being accomplished by the installation and construction of extensive new waste treatment facilities as well as new processing equipment.

The waste treatment construction includes a new oil separation system having a volumetric capacity of about 13.0 M.G.D. and consisting of four parallel units of modern A.P.I. design, capable of handling the industrial wastes plus storm water run-off. That part of the program concerned with process changes includes the installation and construction of a catalytic cracking unit, along with other extensive related facilities, the combined function of which is intended to appreciably improve the refinery effluent, as compared to the acid treatment method used heretofore.

The waste treatment facilities alone are estimated to cost in excess of \$1 million. The overall esti-

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mated cost of both the waste treatment works and the new processing equipment which will result in refinery effluent improvement, are reported as being about \$18 million. The overall program is reported as being about 60 per cent completed, with final completion anticipated by April 1949.

### SUMMARY

The following tabulation summarizes the several classifications of the work with respect to progress to date, as well as the present schedules of completion.

### ACKNOWLEDGEMENT

The authors wish to acknowledge the cooperation of the officials of the several industries listed in this paper, for their assistance in furnishing information which made possible the presentation of the data included herewith.

**Table Showing  
Costs, Types of Improvements and Number of Plants Participating  
with Progress Schedules and Estimated Completion Dates  
Sewage and Industrial Waste Treatment in the Calumet Area,  
Lake County, Indiana**

	Overall Estimated Cost	No. of Plants Partici- pating**	No. of Plants	% of Overall Costs	Estimated Overall % Completion by Partici- pating Plants	Present Schedules of Progress—Overall Basis		
						Constructed and Now in Complete Operation	% Com- pletion During 1948	% Com- pletion During 1949
Sanitary Sewerage Improvements	\$ 8,000,000	19	5	10	55	72	89	100
Industrial Waste Treatment Facilities	4,780,000	4	0	0	76	79	100*	
Reprocessing Changes and Plant Revisions	17,900,000	3	1	2.5	60	75	100*	
Overall	30,680,000	19**	6	4.0	61	74.8	97.1	100

\*April 1949

\*\*Some plants included in more than a single classification.

## FEDERAL AND INTERSTATE

# Pollution Abatement Programs

L. E. Longdon\*

The progress of the industries in cleaning up pollution of the Calumet area, as discussed by Carpenter and Mathews in another article of this issue, is an excellent example of the results that can be obtained by cooperative effort. But of great importance to the country as a whole will be the effect of two recent developments which insure more widespread cooperative effort to eliminate the pollution of our water-courses.

Just before the adjournment of the 80th Regular Congress (Second Session), Public Law 845 was passed. This law, known as the Water Pollution Act, was signed by President Truman on June 30, giving the country, at last, a nationwide approach to the control and abatement of stream pollution.

The general provisions of the act may be summarized as follows:

- (1) This act declares it to be the policy of Congress to recognize, preserve and protect the primary responsibilities of the states in controlling water pollution; to support and aid technical research; to devise and
- (2) This act is limited in scope to interstate streams and declares the pollution of interstate waters to be a public nuisance and subject to abatement. Loans will be made by the Federal Works Administration to states, municipalities, and interstate agencies for the construction and preparation of plans on projects of a comprehensive program nature which are approved by the state agencies and the Surgeon General. Loans will be limited to one-third of the cost of the project, or \$250 thousand, whichever is the smaller.
- (3) \$22,500,000 yearly for five years is authorized to finance these loans.

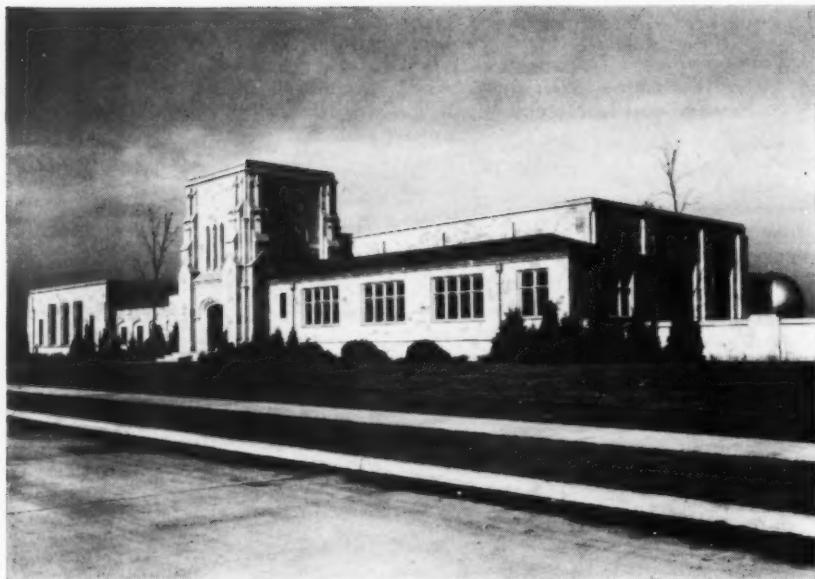
perfect methods of treatment of industrial wastes which are susceptible to known methods of treatment; and to provide federal technical services to state and interstate agencies and to industries, and financial aid to state and interstate agencies and municipalities, for the execution of stream pollution abatement programs.

- (4) \$1 million for each of five fiscal years is authorized to make allocations to states and interstate agencies for investigations, research, surveys and studies in the field of pollution.
- (5) \$1 million yearly for five years is authorized to finance grants for sewage works planning by states, municipalities, and interstate agencies, covering one-third of the cost, or \$20 thousand, whichever is the smaller.
- (6) \$800 thousand yearly for five years is authorized to construct laboratory and research facilities for the U. S. Public Health Service at Cincinnati, Ohio.
- (7) No loans or grants are authorized to private industries. All authorization of loans, grants, and administrative funds are limited to five fiscal years, July 1, 1948 to June 30, 1953.

This was a compromise bill resulting from the many bills which have been pending before Congress over the past two or more decades,

(Continued on Page 8)

\*Treasurer, Pacific Flush Tank Co.



Main building of Fort Wayne, Indiana's modern sewage treatment plant—a community asset.

(Continued from Page 7)

but it finally brings the federal government behind a pollution abatement program, particularly wherein interstate waters are involved. It will be noted that funds are authorized to develop new methods of treatment for industrial wastes wherein known methods of treatment are not effective. Continuing research and water pollution abatement is now assured through the establishment of the Cincinnati Laboratory, and it will be possible to develop means of treatment for those industries whose wastes are so heavily polluting our watercourses and which industries cannot afford to carry on the research work necessary to develop such methods of treatment.

Probably one of the most important effects of the passage of this bill will be in the establishment of the government policy with respect to this class of public works. Limited federal loans will be made available but there will be no governmental grants. Many municipalities have been holding back on starting construction of sewage treatment facilities with the hope that the federal government would again, at least partially, finance these improvements with federal grants. These communities may now proceed, knowing that they must completely finance these projects locally.

the abatement of existing pollution from the rivers, streams, and waters of the Ohio River Basin, which flow through, into, or bound on any of such states.

The signatory states agree also "to enact any necessary legislation to enable each such state to place and maintain the waters of said basin in a satisfactory sanitary condition, available for safe and satisfactory use as public and industrial water supplies after reasonable treatment, suitable for recreational usage, capable of maintaining fish and other aquatic life, free from unsightly or malodorous nuisances due to floating solids or sludge deposits, and adaptable to such other uses as may be legitimate."

This compact provides for a commission consisting of three commissioners from each state and three from the U. S. Government who shall be appointed to control the functioning of this compact.

This compact is a voluntary pledge on the part of the participating states and makes it obligatory to each state to enact legislation "with teeth." Most of our various state laws with respect to pollution abatement do not grant adequate power to the authorized state agencies, such as the state Boards



Map of Ohio River Valley Compact

of Health, to adequately enforce pollution abatement.

It is anticipated that as a result of this Ohio River Compact that the various states will enact uniform and adequate legislation so that the comprehensive program of pollution abatement of the entire Ohio River basin may become a reality.

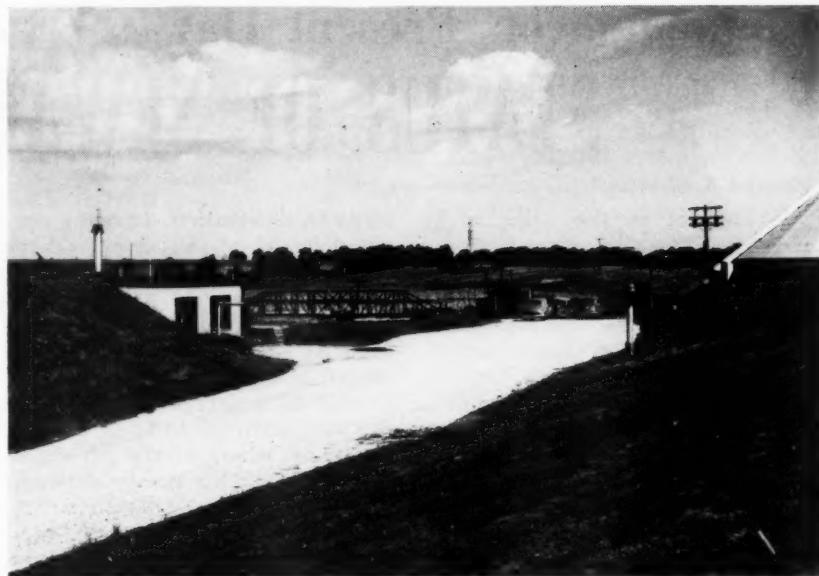
It is interesting to note that within recent years municipalities and industries are becoming more aware of their responsibility in keeping their backyards clean. Whereas two decades ago, and even until comparatively recently, it was only after considerable urging by the various health authorities that any municipality or industry would consider any expenditure for a sewage or waste treatment plant, now many municipalities are trying not merely to do the minimum absolutely necessary "to get by," but are actually trying to provide as complete sewage treatment as is possible. Industries, in considering new plant sites, take into account the cost of the treatment of their waste products. Existing industrial plants are instituting research to eliminate and recover waste products, and when this is not practical, to adequately treat them.

With this cooperation on the part of industry, municipalities and the federal and state governmental agencies, pollution of our streams and lakes may soon be a thing of the past.

#### Aveco Award

In the final ratings of an independent board of judges for the Financial World Report Survey, Avco Manufacturing Corporation was judged as having the best 1947 annual report of the diversified industries. The bronze "Oscar of Industry" trophy will be presented to Victor Emanuel, president of Avco, at the annual awards banquet in the Grand Ballroom of the Hotel Pennsylvania in New York on October 21, 1948.

More than 4,000 corporation annual reports were submitted in this national survey, the eighth in the series, and these were judged in one hundred industrial classifications for "Best of Industry" awards. In the "diversified industries" category, American Home Products was runner-up.



Industry cooperates—Industrial waste treatment plant of National Grain Yeast Company at Crystal Lake, Illinois.

#### Building Code

The Subcommittee of the Committee on Buildings and Zoning has resumed the series of regular public hearings on the second draft of the revised Building Code, prepared by John O. Merrill, Director of Revision, and his staff of consultants.

These hearings will be held as often as possible, consistent with the other official duties of the subcommittee, in order that its report and recommendations may be referred to the full Committee and the City Council at the earliest possible date.



And we spend millions preventing water contamination!

# Comments on Present Day STATUS OF SEWAGE DISPOSAL

Samuel A. Greeley\*

Abatement of the pollution of streams, lakes, and oceans has been much stimulated recently by the enactment of Public Law 845 by the 80th Congress which provides for water pollution control activities in the Public Health Service. Under this act it is likely that a considerable extension of the present amount of sewage treatment will be accomplished. The act provides for careful consideration of water pollution problems not only as related to human or domestic sewage but also as related to industrial sewage. The act appropriates a sum for each of the five fiscal years ending June 30, 1953 of not to exceed \$22,500,000 for making loans and other sums for administration, investigations, research, surveys, and studies. Probably large sums will be spent throughout the United States during the next five years for the construction of sewage disposal projects. It is highly important, therefore, that careful consideration be given to the large amount of operating experience and data which are available to practicing engineers.

While the number of existing sewage disposal projects is large and in many cases their staffs are highly competent, the practicing engineer knows by experience that there are many items of operating information which are not complete or are not readily applicable to new projects. The design and operation of intercepting sewers may be tak-

en as an illustration. In many sewage disposal projects over half the entire cost is required to build the intercepting sewers and their related structures. Very often the capacity of intercepting sewers cannot economically be made large enough to intercept and transport the maximum quantity of sewage, especially where storm runoff enters the collecting sewers either by design or otherwise. Important factors in the design of an intercepting sewer system are the permissible number of overflows into the receiving waterway expressed in terms of their frequency, duration, and quantity. The guidance of operating experience in this particular matter is lacking, as has been well recognized by the Interstate Sanitation Commission under the direction of Seth G. Hess, its Chief Engineer, as reported in Sewage Works Engineering for June, 1948.

While there are many other important matters affecting the economical design, construction, and operation of sewage disposal projects, the permissible length of this article allows reference to only one other. This matter is the method of financing existing and proposed sewage disposal projects. With the general increase in costs, additional revenues are required in many places for the operation and the debt service of existing sewage disposal utilities and to provide funds for new construction, and it appears likely that a large volume of

revenue bonds will be issued. The method of deriving and properly distributing the necessary annual revenue required to cover debt service, operating costs, and all other expenditures, is and will increasingly become of great importance. Realizing that the fundamental considerations of rates and rate structures for sewage disposal projects have not been thoroughly reviewed and stated, the American Society of Civil Engineers and the American Bar Association have each authorized committees who have been directed to report on this matter jointly. Associated with these two groups are the American Public Works Association, the Federation of Sewage Works Associations, the American Water Works Association, and the Municipal Finance Officers Association. The first meeting of the group will be held here in Chicago, October 15 and 16, and it is hoped that their report will be available during the year 1950. Such a statement should be of considerable assistance to municipalities and others seeking a sound and fair method of revenue financing.

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In almost every such case (of illness, physical or mental) work, or the square of work which is hurry, or the cube of work which is worry, carried beyond . . . sane limits . . . is at the root of the trouble.

—“The Five Great Philosophies of Life”

\*Partner, Greeley & Hansen

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# CHEMICAL EXPOSITION

## Leading Chemists, Engineers Will Speak at Annual Show Opening October 12, in Chicago

More than 45,000 representatives of the chemical industry, including technicians, engineers, manufacturers, chemists and executives are expected to converge on Chicago for the fifth National Chemical Exposition and National Industrial Chemical Conference to be held in the Chicago Coliseum from October 12 through 16.

Dr. Charles Allen Thomas, president of the American Chemical Society, will be among the principal speakers, and will lead a discussion on "Frontiers of Chemistry" at the conference.

Other widely known personalities in the chemical world on the conference program are L. B. Howard, U. S. Department of Agriculture; Farrington Daniels, University of Wisconsin; James T. Grey, Cornell Aeronautical Laboratory, Inc.; C. E. Reed, General Electric Company; R. C. Guinness, Standard Oil Company (Indiana); R. B. Semple, Monsanto Chemical Company; C. F. Rassweiler, Johns-Manville Company; R. M. Watrous, Abbott Laboratories; R. C. Newton, Swift & Company; H. M. Corley, Armour and Company; M. C. Rogers, R. R. Donnelley & Sons Company; D. K. Ballman, The Dow Chemical Company; Paul D. V. Manning, International Minerals and Chemical Corporation; and C. G. Harrell and Frank L. Gunderson, Pillsbury Mills, Inc.

"In number and diversity of exhibits, the show will be by far the most representative of its kind ever held in America," said Dr. L. E. Clifcorn, chairman of the exposition committee. "It will reveal the marked progress made in recent years in the chemical industry. Of particular interest will be the exhibit of 'Trail Blazers,' a panel display by individual chemists of new developments, discoveries and applications in the field of industrial chemistry."

Special attention will be given those seeking advice on how chemistry may be used in their manufacturing processes. Of special interest to small business men and manufacturers will be the "Technical Bureau," to be maintained for the first time at any chemical exposition.

The Bureau will be open daily from 3 to 6 p.m. It will be under the personal direction of the internationally known authority, Dr. Ward V. Evans, retired chairman of the chemistry department of Northwestern University, now professor of chemistry at Loyola University, Chicago.

"Dr. Evans is eminently qualified to give helpful, over-the-counter information to those who present specific problems," said Dr. Clifcorn.

The chairman announced that the National Industrial Chemical Conference will be held under the same roof as the exposition. Sessions are scheduled for 7:30 p.m. Tuesday, October 12; 2 p.m. and 7:30 p.m. Wednesday, October 13; 2 p.m. Thursday, October 14; and 2 p.m. and 7:30 p.m. Friday, October 15. A special program has been arranged for students in advanced chemistry Saturday morning, the closing day.

President Thomas, of the American Chemical Society, will be the principal speaker at the Chicago Section show dinner scheduled for 6:30 p.m. Thursday, October 14, in the Armory at 16th Street and Michigan Avenue, in the same block as the Coliseum.

A curtain raiser for the show and conference will be a joint luncheon, sponsored by the Illinois Manufacturers Association, the Chicago Association of Commerce and Industry, and the Chicago Section of the American Chemical Society, and

scheduled for 12 noon Tuesday, October 12, at the Sherman Hotel.

Dr. E. R. Weidlein, director of Mellon Institute, will speak on "Science and the Future," and Bruce Brown, vice-president of Standard Oil Company (Indiana), will have "Petroleum as a Raw Material for Chemicals" as his subject at the "kickoff" luncheon.

Marcus W. Hinson, exposition manager, announces that the show will be open from 12 noon to 10 p.m. daily Tuesday through Friday, and from 10 a.m. to 6 p.m. Saturday.

### Juniors Plan Dinner

All Senior and Junior members of the WSE and their friends are urged to reserve Tuesday, November 2, for the "Kickoff Dinner" featuring John P. Carmichael, Sports Editor of the *Chicago Daily News*, sponsored by the Junior Division at the Chicago Engineers Club, 314 S. Federal St.

Mr. Carmichael, who conducts the widely-read column "The Barber Shop" in the Sports Section of the *Daily News*, is known throughout this area as an entertaining speaker. He will tell some of his human-interest stories about figures in the world of sports.

This evening promises to be a most enjoyable one so remember the date—November 2. Get your reservations early from members of the Junior Division.

### Necrology

Mr. John M. Humiston, of 7107 34th Street, Berwyn, Illinois, died September 19, 1948. He had been a member of the Society since 1920. Mr. Humiston was extremely active in the Society, and had a long record of service on the Admissions Committee. He attended Lake Forest College and Armour Institute of Technology, and at the time of his retirement was associated with the Chicago Telephone Company, now Illinois Bell Telephone Company.

Individuality is the salt of common life. You may have to live in a crowd, but you do not have to live like it, nor subsist on its food.

—Van Dyke

# A Typical Problem in Industrial Waste Treatment

Herman M. Ross\*

One of the prime considerations of public health authorities is to dispose of the normal wastes of the community in such a way as to prevent the creation of a nuisance and to remove any threat to the health of the community and its neighbors. On the other hand, it is the prime consideration of any industry to produce its goods at a cost which will allow it to operate competitively and with a reasonable profit on its investment. It is in the reconciliation of these two factors that the greatest problems in industrial waste treatment arise.

In the area bordering the southern end of Lake Michigan we have an excellent example of the need for an intelligent and active cooperation in the handling of these two considerations. For here, we have great concentrations of industry with its attendant concentrations of population. And here, Lake Michigan serves both as the major receiving body for the discharge of municipal and industrial wastes and as the major source of water supply.

The need for protecting the lake from pollution and contamination is therefore a "must." It has to be

done both by industry and the community working together. The costs of the necessary activities must be intelligently apportioned to each, on the basis of its contribution to the problem. No one solution can encompass all industry and all of the communities in this area. The solutions are as varied as the industries, and a number of them are discussed in another article in this issue.

The extent to which the municipality has to assume the responsibility for treating any individual industrial waste depends on the services to which that industry is entitled by virtue of its position as a member of the community. Beyond that, the individual industry must provide for treatment of its own wastes as its responsibility to the community.

Typical of the trend in industrial waste treatment for control of pollution in the lake, is the manner in which the Standard forgings Corporation of East Chicago, has been attacking its problem. The Standard forgings Corporation uses large quantities of quenching and lubricating oils in its manufacturing process. These oils, together with large quantities of cooling wa-

ters which pick up considerable dirt, form the major waste from their plant. These wastes were being discharged into the sewer system of East Chicago, Indiana.

When the City of East Chicago built its present sewage treatment plant it was determined that it could not handle the volume of waste with the high oil content which Standard forgings was discharging. After consultation it was decided that the treatment plant could absorb the total waste discharge from Standard forgings if the oil concentrations of that waste were reduced to approximately 7 or 8 parts per million. By so doing the community assumed part of the responsibility of treating this waste.

However, Standard forgings was still faced with the necessity of providing sufficient treatment to bring down the oil content of its waste within the specified limit. With the outbreak of the war the problem became even more critical. They expanded production facilities for the manufacture of forged shells and as a result the volume and the oil content of their waste increased. It was therefore decided to install a treatment plant which would produce an effluent acceptable to the City of East Chicago with the prime consideration being given to initial plant cost, economical cost of treatment, minimum maintenance costs, and a plant size which would not take up too much room and thus limit production capacity.

The plant finally decided upon was a Graver Reactivator. This unit was especially designed for the removal of oil and suspended matter with a capacity for treating 750,000 gallons per day. The unit is 35 feet in diameter by 14 feet

\*Sales Engineer, Water Treating Division, Chicago District, Graver Tank & Mfg. Co., Inc.



Graver Reactivator for Waste Treatment at Standard forgings Corp., E. Chicago, Ill.

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high, is fabricated of steel throughout and is set above ground on a concrete floor and is easily accessible for servicing at all points. The plant consists of a series of concentric chambers which provide for pre-skimming of the incoming waste, addition of lime and a coagulant, rapid and slow mixing, the flotation of the lighter-than-water and settling of the heavier-than-water portions of the waste.

Skimming is accomplished in both the pre-skimming chamber and the settling chamber by means of a hydraulic jet system which collects the scum in a trough which in turn discharges into a separating and storage tank.

The settleable solids are removed from the floor of the plant by means of a rotating scraper mechanism which propels the heavy solids to a central sludge well from which they are discharged to waste.

The effluent from this plant is now being discharged to the sewer and while the oil content of the influent may vary considerably the effluent has been maintained at approximately 7 ppm of free oil. No definite figures are available as to the amount of oil removed but during peak operating periods as much as 5000 gallons of oil have been recovered in one day's operation.

Now with the return to normal peace-time production thought is being given to reducing further the overhead cost created by the necessity of pre-treating the plant waste.

A survey of the water requirements shows that they are now using about 20 million gallons of water per month, of which approximately 33½% is for boiler feed makeup and the balance for general use and cooling waters. This water is being purchased at the rate of approximately 10 cents per thousand gallons. It was determined that considerable savings could be accomplished by the addition of equipment to completely remove the oil from a portion of the waste water and use this for boiler feed, thus reducing the amount of water which must be purchased.

Preliminary investigation shows that for an initial cost of about \$16,000 a series of oil removal filters can be installed which will take the effluent from the Reactivator and remove the residual oil

and solids to give a good enough water quality to serve as makeup for the boiler feed-water treatment plant.

The savings thus accomplished may be illustrated by the following set of operating costs for a typical month.

Expanding these same figures for the typical year from which the above monthly data was taken, show that a savings of \$4887.44 could be made that year in plant operating costs by reclaiming sufficient waste water to provide boiler feed makeup. Further study is to be made to determine the possibility of reselling the waste oils collected from the Reactivator, and thus in effect, further reducing the cost of waste treatment.

The case cited here is small and

isolated but is typical of the various factors which must be resolved in order to reduce the pollution danger in Lake Michigan. For the most part, industry is finding that by incorporating waste recovery facilities with waste treatment their responsibilities can be accomplished economically. In fact, many industries are finding that with emphasis on "bottling-up" and waste recovery they can produce a previously unexpected revenue from the materials which would otherwise go down the drain.

**Footnote:** The author wishes to express his appreciation to Mr. W. Gruca, Plant Engineer for Standard Forgings Corporation, for making available his operating costs for inclusion in this article.

### Operating Costs for Reclamation of Waste Water Typical Month (January)

Total number of gallons waste treated .....	13,558,500
Total number of gallons water used for boiler feed.....	7,000,000
<b>Waste Treatment Plant Operating Costs</b>	
Chemicals .....	\$0.00426 Per 1000 gal.
Electric Power .....	0.01250 " " "
Maintenance and Labor .....	0.00654 " " "
Total .....	\$0.02330 " " "
Cost for purchase of boiler water — @ \$0.0927/1000 gal.	$7,000,000 \times 0.0927 \div 1000 = \$670.60$
Cost for reclaiming water for boiler feed from waste	$7,000,000 \times 0.02330 \div 1000 = 152.00$
Total net savings for month.....	\$517.00

### Illinois Engineering

The engineering department of the University of Illinois' Chicago Undergraduate Division at Navy Pier has recently acquired a new Olsen L-Type universal testing machine that will record pressures up to 300,000 pounds. Professor Jo-

seph S. Kozacka, head of the department of engineering at the Navy Pier school, said that the machine will be used to test strengths of metals—iron, steel, bronze, and aluminum—that are made in the foundry laboratory at Navy Pier.

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# THE MUNITIONS BOARD

# PLANS FOR INDUSTRIAL MOBILIZATION

Major General Patrick W. Timberlake, USAF\*

Concurrent with our armed services tackling the big job of redeveloping our military posture to back our national commitments and to maintain an adequate national defense, another agency of the national military establishment is concerned with another enormous job—How to support our armed forces industrially in an emergency?

That agency is the Munitions Board.

The board is the industrial agent of the Secretary of Defense, and is charged with planning the military aspects of industrial mobilization, which is the emergency operation of harnessing our industrial might to provide weapons and equipment for our military forces to combat an enemy successfully.

The Munitions Board is made up of four members: Mr. Thomas J. Hargrave, chairman; Assistant Secretary of Army, Gordon Gray; Under Secretary of Navy, W. John Kenny; Under Secretary of Air Force, Arthur S. Barrows. Mr. Stuart W. Cramer is Deputy Chairman.

It functions principally through its Director of Staff, Lieutenant General LeRoy Lutes. Three other military directors head up the major segments of the board. They are Major General Sidney P. Spalding, U. S. A., Rear Admiral Francis C. Denebrink, U. S. N., and Major General Patrick W. Timberlake, U. S. A. F. Its staff, which is growing rapidly, consists of about three hundred officers of the armed services and civilians, all selected for their special talents and backgrounds in industrial matters.

## Military Requirements

The base for planning industrial mobilization to provide for military needs in an emergency is the knowledge of what those military requirements will be. Development of this knowledge starts with the Joint Chiefs of Staff. The J. C. S. is charged with the responsibility of developing a "strategic concept,"

\*Air Force Director, Munitions Board

which is an integrated strategic plan for defense and offense.

Upon development, the strategic concept is passed on to the three services which translate it into operations and logistic plans necessary to carry it out. These plans, in turn, are translated into the munitions necessary for their fulfillment—the ships, planes, guns, ammunition, tanks, and countless other commodities of war. After this, a further breakdown into the basic materials necessary to produce such munitions—amounts of steel, copper, aluminum, and others.

The requirements in munitions and the materials necessary to produce them are transmitted to the Munitions Board for correlation into the overall military requirements and for determining whether the nation can meet them, how it will meet them, and how the burden of production will be spread equitably.

## Facilities

Spreading the burden equitably demands careful planning and an exact knowledge of the productive ability of U. S. industry. Recently, the Munitions Board initiated the second phase of a plant survey which will provide that knowledge. The project is called the "Allocation of Private Industrial Capacity for Procurement Planning of the Armed Services."

The first phase of the project was a paper operation. The three services requested specific U. S. industrial facilities desired in their procurement planning. The Munitions Board allocated facilities to the various services in accordance with what it deemed best for national defense.

On March 30, after thousands of these allocations were made by the board, the second phase of the project started. Officers from the three services began to contact representatives of the plants allocated to their individual services to determine what the plant could produce in time of war, and how

much. An increment of 11,000 plants is involved in this phase of the operations. Ultimately, it is contemplated, about 25,000 plants, which, along with their vast number of sub-contractors, represent about 90 per cent of U. S. productive capacity, will be contacted as the project moves to completion.

Results of this program will provide basic knowledge to enable quick and efficient peacetime-to-wartime conversion of our productive ability. If only partially completed by the time an emergency should occur, it will save much time, and time is one of the most important elements in modern warfare. For the manufacturer, it will provide a knowledge of his probable production role in the event of war. This will enable him to prepare by giving him sufficient time in which to anticipate, study, and overcome probable and potential production problems.

Along with the problem of planning for the conversion of private industrial capacity to war production in time of emergency, the Munitions Board has had the responsibility of preserving our World War II, government-built, munitions-producing facilities. A good number of such plants have been preserved in an industrial reserve by the armed services, while the capacity of others is conserved through application of the National Security Clause in the sales agreement of plants being sold.

The clause is an agreement by the purchaser to keep the plant in a condition which will enable quick reconversion to war production if so needed. At this writing, plants not so protected are being restudied in light of current events.

## Basic Materials

In addition to compiling the military requirements of raw materials necessary in the production of war equipment, conducting surveys to determine the availability of such materials, and planning the military aspects of industrial mobili-

zation concerning these materials, the Munitions Board is charged by law with administration of the Stockpiling Act (Public Law 520, 79th Congress.) This act provides for the development of a national stockpile of strategic and critical materials. These are materials absolutely essential for military and civilian uses in time of war and which are not to be found in sufficient supply within our borders. In most cases, they must be transported from sources three to ten thousand miles away, necessitating, of course, in time of war, the hazard of wartime shipping and isolation.

One of the board's basic assumptions is that, should another war occur, this nation will not have sufficient time in which to bring strategic and critical materials within its borders in quantities sufficient to supply our industrial war production. So it is mandatory that sufficient stocks be developed within the U. S. during peacetime.

#### \$600 Million Stockpiled

By May of this year, \$275 million appropriated in past sessions of Congress for purchasing materials for the national stockpile was spent or obligated. \$320 million worth of strategic and critical materials in residue of World War II is also being transferred to the pile, placing the progress made in two years over \$600 million.

Although this represents a sizable achievement, the stockpile is behind in schedule and is unbalanced. Rate of acquisition has been slow because of lack of availability of materials. Every effort has been made by the Munitions Board to refrain from purchasing any critical materials in short industrial supply because it is the belief of the board that any substantial detriment to American industry, must, whenever possible, be avoided. A healthy, producing economy is one of the best components of national defense.

Limited appropriations have restricted acquisition, too, but Congress has provided more ample appropriations for the future, recently voting \$225 million in cash, and authorizing contract authority for another \$300 million. A

national stockpile of about \$3,400,000,000 is the goal.

#### Manpower and Utilities

A definite knowledge of U. S. manpower, electric power and other utility power is required for effective industrial mobilization planning for the military needs of our nation in time of emergency. At this time, studies in these fields are underway within the Munitions Board, and the results of these studies will provide invaluable knowledge for effective planning. Detailed information of our industrial manpower requirements in the event of an emergency is extremely important. Our manpower planners are fully aware that it is folly to withdraw people from industries engaged in producing the tools of war until the services of these people are required in uniform.

#### Procurement Coordination

The Munitions Board has the responsibility for the coordination of procurement, production and distribution plans of the departments and agencies comprising the national military establishment. It is charged specifically "to recommend assignment of procurement responsibilities among the several military services, and to plan for standardization of specifications for the greatest practicable allocation of purchase authority of technical equipment and common use items on the basis of single procurement."

This task can best be explained in an enumeration of some of the present undertakings of the board in the fields such as: (1) Joint Army-Navy Air Force Specifications; (2) Uniform standards; (3) Single system of cataloging military supplies and equipment with common nomenclature; (4) Uniform specifications and quality control policies and procedures; (5) Uniform contract forms and clauses; (6) Uniform pricing and purchasing policies; (7) Uniform policies in use of transportation facilities; (8) Uniform auditing and accounting procedures; (9) The elimination of unnecessary overlapping and duplicating procedures among the Services; and finally (10) Assignment of single-service procurement where practicable, particularly in common use items such as food, coal, lumber,

etc. The latter items, among a number of others, have already been assigned to the procurement office of one of the services which will purchase all of such materials for both of the other services as well as for its own.

#### Foreign Trade

There is a strong military interest in the conduct of our foreign trade in peacetime as well as in war. From a military standpoint our trade should be conducted in such a manner as to provide adequate protection against diminishing our resources below the limits required to meet our needs and the needs of our potential allies in a national emergency.

Government policy in foreign trade is directed through inter-departmental committees and boards and the Munitions Board, voicing military interest in foreign trade, is represented in most of them.

#### Industrial Security

The Munitions Board also deals with the military aspects of industrial security, including recommendations for dispersion of highly critical industries, possible underground sites in some cases, protective construction, prevention of sabotage, and priority of protection for plants.

Highway users paid at least \$1,118,345,000 in emergency Federal automotive excise taxes during the fiscal year ended June 30—another all time high—and 14.6 per cent above the previous year's collections. Included in the figures are the highway users' share of the federal taxes on gasoline, lubricating oil, new cars, motorcycles and trucks, parts and accessories, and tires and tubes. Not included are the taxes on pipeline transportation of petroleum, and transportation of persons and property.

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This is International's mine and refinery as it looks on the surface with storage warehouse, refinery, headquarters and head-frame . . . but underground there are miles of passageway where miners work.

## The Story of A Company . . .

James A. Barr\*

Last year a gleaming white, ultra-modern food plant went into production at San Jose, California, turning out the world's largest output of mono sodium glutamate—a food flavor accentuator that is fast pushing its way towards widespread acceptance in fine American cookery as it already has in the field of food manufacture.

This year at the opposite end of the country at Mulberry, Florida, newsmen from some of the major newspapers and press associations of the country along with hundreds of visiting dignitaries were on hand for the opening of the newest and largest phosphate mine in the western hemisphere which, alone, will supply one-half the needs of this country for that vital component of agricultural fertilizer.

Next year will witness the opening of a large new refinery turning out chemical grade muriate of potash and sulphate of potash at Carlsbad, New Mexico. This project will represent a substantial addition to the potash mine and refinery already on the site.

Three projects, as widespread in

location as in nature, yet all important phases in the history of a once little known concern that today has become one of the major chemical companies in the country. The link between these far-flung enterprises lies in the heart of Chicago at the general headquarters of International Minerals & Chemical Corporation. Its stature today is evidence that able management, superior research, sound engineering, and courageous foresight welded together in right combinations will create those progressive industrial enterprises which are so basic to the progress and might of our nation's economy.

Its change of name from International Agricultural Corporation to International Minerals & Chemical Corporation indicated the scope of a new policy prior to the war, under the leadership of its new president, Louis Ware, who took office in 1939. The following year the company acquired complete control and merged with the Union Potash & Chemical Company of New Mexico. The merger climaxed the development of the subsidiary and shortly thereafter saw the

opening of a new potash mine and refinery at Carlsbad in 1940—just in time to serve the nation's critical needs born of war when foreign imports were cut off. Today, the potash division is one of the Big Four of the potash industry which turns out 98 per cent of the nation's production. From potash mining and refining, the company grew into the production of potassium chloride and wartime magnesium.

Two years later, the Amino Products Company of Toledo, Ohio, was acquired, opening up an entirely new field of food chemistry for the corporation. Mr. Ware saw a great future in the principal product of the Toledo plant, namely, mono sodium glutamate as well as other important amino by-products used in the field of pharmaceuticals. Long known to orientals who universally used the crude glutamate in their cookery, the product was being used by a few American food processors. Under the skillful promotion by International, food manufacturers, hotels, and great-name restaurants are utilizing the pure vegetable glutamate as a flavor intensifier for their packaged

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products as prize dishes.

Phosphate mining has reached new proportions with the recent opening of the Noralyn mine in Florida—the result of four years of research and design, plus two years of construction. The output of the new mine will enable International to produce as much phosphate as all the rest of the companies in the business with  $3\frac{1}{2}$  million tons annual capacity. This enormous increase of output does not represent an advantage over competitors, but is a contribution to a hungry world that needs this vital component for commercial fertilizers both here and abroad.

International sells about 80 per cent of its potash and phosphate to others, including many of its fertilizer competitors, using the remainder for its own products. At the same time, it has greatly increased the size, scope, and profitability of its own plant food operations owing to the tremendous increase in demand for fertilizer. It is the only fertilizer manufacturer supplying its own needs for two out of the three basic ingredients.

It is important to note that this industrial empire rests upon a solid base of research. Perhaps it is sig-



Arriving at the shaft's bottom, each car is moved onto the rotary dump. This holds the car on a movable section of rail while it is rolled completely over, dumping the ore into a chute below.

nificant to know that no basic research was carried on by the company a decade ago. The annual budget for research currently carries an appropriation approaching one million dollars. As never before, the atomic age has placed a premium upon research. Before the engineer applies the lessons of science, the experimenter and researcher have paved the way in making vital and sometimes substantial additions to the body of

scientific knowledge. Heavy research, it goes without saying, has gone into the preliminary planning of every one of International's huge projects.

Not content with the constant experimenting in laboratories scattered throughout the country, the company has spent over \$112,000 in the past few years as grants-in-aid to colleges of agriculture and state experiment stations for basic study in plant foods and soil conservation. This program is consistent with the major long-term objective of the company, namely, improved volume and quality of food for human consumption as well as its palatability. Yet this program is expected to become more intensified. Dr. Paul D. V. Manning, who was brought to International in 1941 to head up its new research division, is now considering the erection of a centralized laboratory in the Chicago area where top facilities can be provided for this important function. Here, the probing will be extended for more ways in which to take the raw materials of the earth that, with the ingenuity of human skill, will turn out more and better products for human welfare.

International is an excellent example of the close association of industrial progress and public welfare. This policy not only is reflected in individual industrial health, but constitutes one of the principal pillars upon which the strength of our nation rests.



Reject waters from the Noralyn plant are discharged into a settling pond where the water is cleared for re-use or return to a stream.

## W S E Members

# Attend International Soil Conference

Three members of the Western Society of Engineers were among the forty-two American representatives who attended the Second International Conference on Soil Mechanics and Foundation Engineering which was held in Rotterdam, Holland late in June. L. F. Harza, John P. Gnaedinger, and Theodore W. Van Zelst were present for the ten day session of international meetings.

Mr. Gnaedinger and Mr. Van Zelst joined a group of United States engineers in travel to the conference and visited a number of engineering installations and laboratories with the group in France, Switzerland, Belgium, Luxemburg, Holland, and England before and after the formal meetings.

Mr. Harza, who was accompanied by Mrs. Harza on the trip, also attended the World Congress on Large Dams which met in Stockholm, Sweden the week preceding the Soils Conference.

During the final sessions, groundwork was laid for an International Society of Soil Mechanics and Foundation Engineering with an aim toward promoting international cooperation among scientists and engineers through the interchange of knowledge, ideas and the results of research and practical work in the sphere of soil mechanics and its related fields. This will be accomplished through the medium of congresses and the publication of annual reports containing a review of the contributions which each country has made during the previous year period.

The International Society will be composed of a union of national committees. It is believed that the United States' National Committee on Soil Mechanics will affiliate with one of the existing national engineering societies.

Five volumes of the conference proceedings, containing a total of

over 360 technical papers from all parts of the world, have already been printed and are being distributed to applicants. A sixth volume will contain the actual proceedings and all prepared discussions which were presented at the meetings.

Information concerning the International Society and application forms for purchase of the proceedings may be obtained by writing to the Secretary, Second International Conference on Soil Mechanics and Foundation Engineering, c/o Laboratory of Soil Mechanics, Oostplantsoen 25, Delft, The Netherlands, or to Prof. P. C. Rutledge, Chairman, U.S. Committee on Soil Mechanics, The Technological Institute, Northwestern University, Evanston, Illinois. The cost of the Proceedings is 75 guilders (approximately \$28.30) for the set of six volumes. Remittances should be sent with application forms directly to the Secretary in Holland.

## PROBLEMS AND POLICIES OF

# CHICAGO'S 1,445 HOTELS

Lewis B. Ermeling\*

Chicago, the second largest city in the United States, located at the crossroads of the nation, has many hotels of world renown. The Hotel Sherman and its predecessors have been on the same location at Clark and Randolph Streets, for over one hundred years. The Empire Room in the Palmer House and the Beach Walk of the Edgewater Beach Hotel are world famous. The forty-two story Morrison Hotel is the tallest hotel in the country. The Stevens is the world's largest hotel, both in guest rooms and public space, including its Exhibition Hall. The Pump Room in the Hotel Ambassador-East has probably received more publicity than any other hotel dining room. Among Chicago's better known residential hotels are the Windermere and Southmoor on the

South Side, the Graemere on the West Side, and the Belden-Stratford and the Seneca on the North Side.

Most Chicago visitors believe that there are scores of large hotels in Chicago, whereas there are only five that have more than one thousand sleeping rooms. In the Chicago Metropolitan area of Cook County there are 1445 hotels, but they average only 97 rooms per hotel. This means that there are hundreds of smaller hotels of 40, 50 and 60 rooms, providing homes for a substantial number of Chicago families.

During normal times transient hotels have their heaviest occupancy from Monday through Thursday with the commercial travelers returning home for the week end. During the war, with

the tremendous number of men in the armed services receiving their training near Chicago, this pattern was reversed, for the service men had their leave or liberty over the week end. Chicago hotels cooperated both with the Army and Navy to the fullest extent. For those traveling on official orders for the armed services, Chicago hotels allocated rooms which the Army and Navy assigned directly, and thus were assured of accommodations for their personnel.

The operating problems of hotels are varied and interesting. When a guest registers in a hotel he actually opens a charge account, but the hotel has no means or time to check the guest's credit or responsibility. A merchant will check the party before credit is extended or goods are delivered. To protect hotels, all states have innkeeper's

\*Executive Vice President, Greater Chicago Hotel Association.

laws in varying degrees. Under the Illinois Statute, if a hotel guest is unable to pay his bill when it is presented, that is considered *prima facie* proof of intent to defraud and a complaint can be signed for his arrest. Fortunately most of the traveling public are honest and hotel losses on uncollected delinquent accounts are relatively small. A teletype installation to the Hotel Association is used for credit checking.

Hotels offering complete service such as coffee shop and dining room, bars or cocktail lounges, valet service, etc., have about 70 employees for each 100 rooms in the hotel. The guest contacts but a small portion of the hotel personnel—the doorman, reservation or desk clerk, bell boy, elevator operator, waiter and cashier. They seldom see the maid and less frequently contact the maintenance department, kitchen, store room, accounting, laundry or telephone personnel.

One of the most interesting departments in a hotel is the reservation department where letters, telegrams, and most telephone message requests for rooms are handled. The hotel is able to provide accommodations only as rooms become available, and for this reason are interested in the date and time of arrival as well as the length of stay. A severe snow storm or flood which delays arrival time of trains and probably grounds planes, means that new arrivals and expected departure schedules are immediately upset. From Chicago hotel records, about 18% of the persons who make hotel reservations neither cancel the reservation nor arrive to take their rooms, and such reservations are designated "DNS" or "did not show." This is the reason hotels clear their room racks in the early evening, so that they are not caught with a number of vacant rooms and thereby lose substantial room revenue. There is no market for yesterday's vacant room.

A hotel must maintain a substantial occupancy ratio in order to break even. The pre-war rule of thumb, that 60% occupancy would permit the hotel to break even on operating costs has been raised to



Lewis B. Ermeling

an average occupancy of 82%. This does not apply to every hotel but is an index of requirements. There are many heavy expenses. For example: in 1946 the downtown hotels in Chicago paid real estate and personal property taxes of \$177.31 per room. This tax money can be expressed as requiring fifty cents from every room in the house each day, whether occupied or not, to pay real estate taxes alone. During the past two years the tax figure has increased substantially.

The larger hotels in Chicago are also subjected to some thirty-one city licenses and permit fees covering almost every operation. The revolving door where the guest enters requires an inspection fee, and the weighing scale where the ashes and waste products are checked out, takes another.

The general public believes that all departments of the hotel operate at a large profit. This unfortunately is not true. In the dining room and coffee shop, profit will not average more than two and one half to three per cent and this is without charging rent for the dining room and kitchen space occupied.

Hotel telephone service is probably the least understood, as some guests inquire about the charges for local telephone calls. In addition to paying the monthly rental to the Telephone Company for each trunk line, switch board position,

and for every extention phone in the hotel, they also pay for each call above the minimum. Payroll cost for the salary of supervisors and operators is heavy. Five downtown hotels have 178 employees in their telephone departments to provide twenty-four hour service every day of the week. Their annual telephone department payroll is \$390,000.00.

The building boom of the 1920's placed Chicago in the position of an over-built hotel city. During the 1930's, occupancy in transient hotels ranged from 33.67% in 1932 to 52.67% in 1939, except that during 1933, with five good months of business during the Century of Progress, occupancy was 53.65%. During the early days of the war, in September 1942, the Congress and the Stevens were taken over by the Army for training. Under the stimulus of war contracts and men in service occupancy zoomed to a high of 89.88% in 1945. For the first seven months of this year occupancy in the transient hotels has averaged 83.38%, which is dangerously near the break even point.

Chicago hotels and other local business houses are quite dependent upon large conventions and trade shows being held here. During 1947 the Convention Bureau records show 946 groups meeting in the city. Many of the larger affairs held in Chicago such as the Machine Tool Builders, the Road Builders, the American Medical Association, the Automotive Service Industries and others, tax the hotel room facilities. Where rooms in many hotels are needed to accommodate the visitors and delegates, a central room reservation office is used so that accommodations are assured to those coming to the city.

From an engineering viewpoint, hotel operation presents many interesting features. The volume of air-conditioning probably ranks near the top among all businesses. The amount of water used—both hot and cold—is tremendous. The electricity use is high, and the gas bill for kitchens and laundry is a substantial amount. As hotels have been pioneers in using new devices, radio and television are well up on their list.

# If An Atomic Bomb Hit City "X"

R. E. Lapp\*

This article is a revision of an earlier report prepared by Dr. Lapp while serving as scientific advisor with the War Department General Staff. It outlines the probable effects of an atomic bomb explosion upon an American city and discusses a few aspects of atomic defense. Dr. Lapp, formerly Assistant Director of the Metallurgical Laboratory in Chicago, is now Executive Director of the Committee on Atomic Energy of the Research and Development Board. Views expressed by the author are his own and do not represent those of the National Military Establishment or of the Atomic Energy Commission.

Sufficient data have been published about the effects of atomic explosions so that a fairly consistent picture of the phenomena may be pieced together. The purpose of this article is to present these data in summarized form and to translate these facts objectively so that they may be visualized in terms of the probable effects of an atomic attack upon American cities.

During the summer of 1946 the atomic bomb tests which were carried out at Bikini clearly demonstrated to the trained observer the unique effectiveness of the atomic bomb as a military weapon. Yet to many the Bikini tests were a disappointment. Those who expected to see naval vessels catapulted heavenward were dismayed. Those who examined the target fleet after the first Bikini detonation and expected to find most of the ships capsized or inoperable found that the vessels more than 1000 yards from the center of blast were little damaged.

Many did not stop to appreciate that the ships riding at anchor in the Bikini lagoon were not only integrally strong structures but they were able to withstand severe shock by recoiling in the water. At Hiroshima buildings more than 2 miles from the blast were destroyed; this is explained by the fact that many urban structures are ex-

tremely weak and being rigidly anchored to the ground they are easily damaged by a blast wave.

For the purpose of simplifying the initial discussion, the analysis of the bomb effects will be applied to a hypothetical City "X". City X is assumed to be a typical American metropolis having a population of about 1 million people. Furthermore, City X is assumed to be of sufficient importance to the nation so that it constitutes a prime target for atomic attack by an aggressor. Later in the discussion a specific city will be substituted for City X in order to emphasize certain of the bomb's effects.

## The Aggressor's Problem

Any aggressor nation proposing to employ atomic weapons in a future war is immediately faced with such an enormous array of problems that a consistent solution of only a fraction of them might be possible. For example, it must decide what type of bomb it will employ. This, in turn, may be a function of the scientific, technical, and economic resources of the country as well as a function of what is most desired from a strategic and tactical viewpoint. Furthermore, the aggressor must have some idea of how many bombs will be required, how these will be delivered, and what role they will play in causing the capitulation of the attacked nation.

To the extent that an enemy nation could evaluate the probability that any specific type of atomic attack would result in a victory, it would have to know how much punishment the Americans could suffer before capitulating. Would the United States concede victory to the enemy if ten of its principal cities were wiped off the map? Or if 50% of the inhabitants of these cities were killed? And if not ten cities, how many? There is no precedent of an air attack upon this country and there is accordingly little basis for estimating how the citizens of this country would react to an atomic attack.

The enemy, in standardizing upon a specific type of atomic bomb, would be justified in selecting the one which gave the maximum destructive effect per pound of fissionable material. To the layman the significance of the phrase "per pound of fissionable material" may not be apparent unless it is realized that the fissionable elements, uranium-235 and plutonium-239 are scarce materials. In fact, these elements are so valuable that one might say that the world has gone off the gold standard and is now on a uranium standard. Aggressor nations will measure their strength in terms of the amount of fissionable material which they stockpile.

An enemy will then assess a target city in terms of how many pounds of fissionable material it can allocate to its destruction. To do this the enemy must know how much the target city contributes to the nation's fighting strength.

A lower limit to the quantity of fissionable material which may be allocated to a target is set by the fact that atomic bombs have a critical size. Actually the trick in detonating atomic bombs is to keep them below critical size until the time desired for explosion.

The atomic bombs which have been used to date are commonly said to be equivalent to 20,000 tons of high explosive. It is to be expected, as in any new field, that improvements will yield atomic bombs of greater explosive power.

Suppose that an enemy nation elects to develop and employ a bomb which is roughly twice as powerful as the Nagasaki bomb. To be specific, let it be arbitrarily assumed that this hypothetical bomb is equivalent to 50,000 tons H.E. Throughout the remainder of this article all references to atomic bombs pertain to this hypothetical 50,000 H.E. type.

## Choice of Altitude and Point Zero

The enemy, having elected to use a 50,000 H.E. bomb now turns to the problem of detonating the bomb to achieve maximum effect upon City X. In this connection, it is

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assumed that the enemy has solved the delivery problem and has developed long range, high speed bombers which can penetrate the nation's defenses with minimal attrition.

City X has two vital sections. One is the aircraft production center (section A in the accompanying diagram) about 5 miles from the center of the city. The other is the enormous steel industry located to the south of the city (section B). Between these two vital areas lies the built up section of the city and a multitude of feeder industries which supply the aircraft plants with components and materials.

In planning an ordinary bombing mission, it would be a simple problem merely to assign so many conventional bombs to be dropped on sections A and B of the city. For an atomic bombing, the problem is vastly more complex. Detonation of a single 50,000 ton bomb midway between the two vital areas would not do appreciable damage to either. On the other hand, consideration of the difficulty of delivering two atomic bombs and evaluation of the allowability of assigning two bombs to the city might well argue against dropping a bomb on each of these production centers.

It is quite possible that the enemy might decide to use only one bomb against City X and employ it to kill off the maximum number of people and destroy the multitude of feeder industries near the center of the city. By so doing, the aggressor might well knock out the effectiveness of the two production centers.

Let it then be assumed that the enemy decides to explode the bomb over the center of the city. It is now necessary that the foe determine exactly where the bomb should be used to explode so that the bomb has maximum effect. To simplify the discussion let the location at which the bomb is detonated be called "Point Zero" and the position on the ground directly below the point of detonation be called "Ground Zero."

It should be obvious that if the bomb is detonated at too high an altitude the effects of the air burst will not be intense enough to cause extensive damage on the ground.

On the other hand, if the Point Zero is close to the ground the area damaged by the blast will be relatively small even though the damage wrought throughout this area would be extremely heavy. At some intermediate point, there will be a compromise between intensive and extensive damage. This altitude for a 50,000 ton bomb is taken as about  $\frac{1}{2}$  mile above the ground.

At Nagasaki, where the bomb was exploded high in the air, about ten square miles of the city were hard hit by the blast, whereas at Alamogordo, where the bomb was exploded at low altitude only three square miles or less were damaged to the same degree.

While it is not usually feasible to determine the altitude of detonation independently of ground zero, it has been done in this case for the sake of simplicity. The diagram of City X clearly shows that much of the city's industry and population is located near the lake. In fact, the built-up area of the city fans out radially to the northeast. As much as 50% of the bomb's destructive power would be wasted if it were detonated near the shoreline (two miles southeast of the marked Ground Zero) for it would be dissipated over the water.

Therefore, the enemy elects to waste only a small fraction of the bomb's effect and selects Ground Zero some two miles in from the shoreline.

The above analysis is only valid for what is called an "air burst." Later in this article sub-surface detonation will be considered.

#### City X Is Attacked

As the atomic bomber heads for City X as part of a sneak attack from the north, City X is enjoying a pleasant sunny day with a cooling breeze coming in off the lake. The streets in the downtown area are thronged with thousands of shoppers.

High in the stratosphere above the city, the bomber's lethal weapon is dropped. Seconds after the jet propelled plane has noiselessly banked into a sharp turn and headed north again, the bomb explodes 2500 feet above Ground Zero.

A dazzling flash blinds the people on the streets below and at the same time sears them with its

multi-million degree heat. Within a thousandth of a second the bomb has changed from inert matter to a small sphere of white-hot, highly compressed gas. From this a ball of fire forms and immediately expands into a varicolored sphere of flame. This grows ever larger and rushes downward toward the earth as well as in other directions. The ball of fire vanishes quickly giving rise to a huge pinkish-white atomic cloud which mushrooms over the city obscuring the sun.

Directly under the blast, the evanescent flash of heat has seared pedestrians into unidentifiable charred, grotesque forms. Those fortunate enough to have been shielded from the heat are momentarily conscious of a crushing blast wave.

A blast wind of near supersonic speed follows hard upon the primary blast wave and demolishes those buildings still standing around Ground Zero. The air is thick with dust from pulverized buildings. Soon the crashing of shattered buildings is succeeded by the quiet yet more ominous sound of fires.

To feed the multitude of fires, kindled by the heat flash and also ignited by secondary effects, air rushes in from the surrounding area toward Ground Zero. Even the prevailing breeze from the lake is overcome as the "firewind" assumes gale proportions and sweeps the city. This unusual fire-storm persists for several hours turning the entire area around Ground Zero into a raging holocaust.

The fire-fighting equipment close to the center of destruction is useless but valiant smoke-eaters from other parts of the city rush in other equipment only to be turned back by the blinding heat. Even those specially equipped for disaster work find that their equipment is barred from the stricken area by streets made impassable with debris. The almost immediate failure of water pressure together with disrupted communications makes the task of fire-fighting even more hopeless. At best the city's forces were suited to combat a dozen fires simultaneously; against hundreds of fires spread over a large area, the fire-fighters must retreat and prepare

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# Atomic Bomb

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fire breaks to stem the onrush of the blaze.

## Survey Of The Damage

As soon as they can be gathered together, a group of experts are dispatched into the stricken areas to evaluate the damage which City X has suffered. In order to evaluate the bomb effects, let the survey first concern itself with an analysis of the property damage. Furthermore let it be assumed that no attempt will be made to distinguish between primary and secondary effects or between blast and fire damage.

The various zones showing different degrees of damage are illustrated in the accompanying diagram. In the first zone nearest to Ground Zero the destruction is very heavy and in many cases is almost complete. This degree of destruction extends outward radially from Ground Zero to a distance of almost 1 mile. Within this area of about  $2\frac{1}{2}$  square miles all frame and brick buildings are demolished and only a few sturdy, reinforced concrete structures on the periphery of this zone escape complete destruction. Even the latter buildings, while seemingly intact are thoroughly gutted by fire. The roofs and floors of these buildings are collapsed.

The survey of the innermost zone is accomplished with great difficulty as the streets are made impassable by debris and toppled buildings. In some instances especially right at Ground Zero it is difficult even to recognize where the original streets were located.

Beyond the periphery of the first zone and extending to a distance of about  $1\frac{3}{4}$  miles from Ground Zero, the damage is heavy. This second zone includes about 6 square miles of the city exclusive of the first zone. Here some of the larger well-built structures seem to be intact but closer examination shows that their interiors are extensively damaged. Almost all the structures having large roof spans are collapsed. Even those office buildings whose walls remain upright are stripped of their facing and the

streets are clogged with this material. A few of the buildings at the periphery of this second zone seem to have miraculously escaped severe damage. The experts agree that these structures were either "skipped" by the blast or were shielded by nearby buildings.

A few of the survey party make their way up an external fire escape of one of the few remaining tall buildings. Pausing half way to the top they notice that the "shadow" of the fire escape is burned into the wall producing a weird reminder of the intense heat flash emitted by the bomb. One of the experts quickly measures the angles which the "shadow" subtends and comparing the data with another measurement made on another building, he announces that the bomb was detonated at approximately  $\frac{1}{2}$  mile above the surface of Ground Zero. From the vantage point of the top of the fire escape, the party surveys a scene of utter desolation. Within a circle about  $3\frac{1}{2}$  miles in diameter City X has ceased to exist. Farther out from the edge of the second zone, they mark out a third zone wherein moderate damage has been sustained.

This third zone extends to about  $2\frac{1}{2}$  miles from Ground Zero. It covers an area of 10 square miles exclusive of the two inner zones. Here the majority of the buildings which are leveled are frame dwellings and plants of light construction. The Municipal Terminal and several large theatres are also demolished. But this is the first area which bears some resemblance to a city. Streets are, in general, fairly clear of obstructions.

Farther out from the center of City X, the damage progressively falls off so that between the periphery of the third zone and a circle some 7 miles in diameter there is slight damage. Destruction by fire is evident in many places especially to the east where the fires were spread by prevailing winds. Beyond this zone, extensive damage is encountered only occasionally and must be attributed to the vagaries of the blast wave.

## Some Facts About Radiation

When the atomic bomb explodes it emits an instantaneous burst of penetrating nuclear radiation. This

is an enormously intense flash of neutrons and gamma rays. Other nuclear radiation is also present but is unimportant compared to the two mentioned. The neutrons and gamma rays are little affected by the atmosphere (except over considerable distances) and can penetrate through the walls of buildings.

After the bomb has exploded, there remain radioactive particles sometimes called particulates. These are fission products which result from the fission of U-235 or plutonium. They are highly radioactive emitting gamma rays and in addition less penetrating particles known as beta rays. They do not emit neutrons after the first minute the bomb has been exploded. Normally the atomic cloud which forms after the bomb has exploded carries up almost all these radioactive particulates into the stratosphere whence they are dispersed by high altitude winds until they are harmless. These fission products "decay" so that they become less intense with the passage of time.

Normally the fission products are dispersed in the upper air but under certain conditions a "fall out" from the radioactive cloud may occur. Wherever this fall takes place, the vicinity may be contaminated with these radioactive particulates. It is conceivable that a heavy rain might wash some of the fission products out of the atomic cloud and shower down upon the city a deadly rain of these particles.

It should be emphasized that neutrons, beta particles, gamma rays and for that matter, any radioactive material can be present in lethal intensities without any immediate effect upon the senses. To be sure, after a while there is a decided physiological effect but by that time it is too late for the victim to avoid the source of radiation. Scientists do not understand the fundamental means by which nuclear radiation produces changes in human tissue, but they do know what happens to such tissue after it has been exposed to radiation.

As a result of exposure to intense nuclear radiation, certain physiological changes occur within the body which produce characteristic symptoms of "radiation damage."

These symptoms include nausea, vomiting, general debility, sustained fever, loss of body hair, erythema (redness of the skin caused by capillary congestion), loss of appetite, and a decrease in white blood cell count. Some of these symptoms may appear soon after exposure while others may not appear for a few weeks. Furthermore exposure to radiation may be accompanied by other injury, as from burns or from shock, which may then be complicated by the radiation damage.

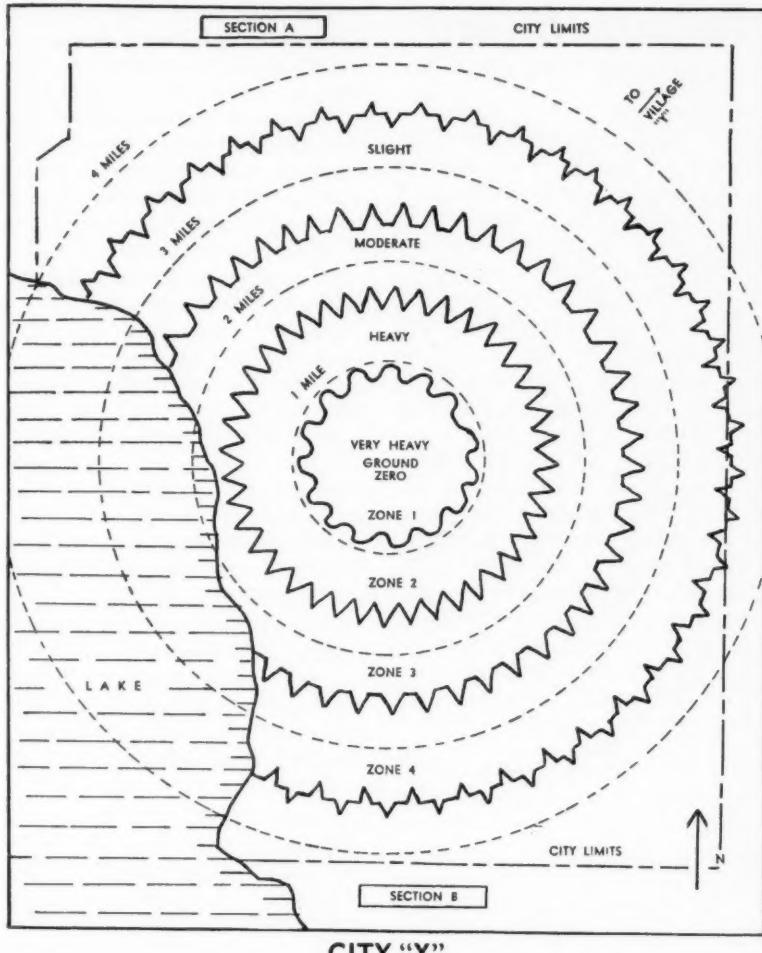
There is very little, if indeed anything, which medical science can do for persons who have received more than a certain critical amount of radiation.

#### Effects of Radiation on Population

All persons living within the first zone of City X would be exposed to a lethal dose of nuclear radiation. Many of these would, of course, die from fire and blast effect so that it is difficult to tabulate the casualties according to the exact cause of death. Here and there within the first zone, a very few people might not receive a lethal dose of the radiation due to the fact that at the time of the detonation they were shielded from the radiation either by being underground or behind thick concrete walls. However, the total survivors would be less than 1%.

Within the second zone defined by the degree of blast damage, many people would receive a lethal exposure of radiation but the effects of shielding would be more appreciable. Those in frame houses close to the periphery of the first zone would certainly perish but those farther from this line would stand a better chance of survival. Perhaps as many as 50% of the people in this zone would be the victims of this unique killing power of the atomic bomb. Many would show signs of radiation sickness even though they survive the atomic attack. Of these, a considerable number would recover from the early effects of radiation sickness and thereafter live apparently normal lives.

Outside the second zone there would be negligible loss of life from radiation damage from the primary flash of the bomb. If, however,



CITY "X"

there had been a fall-out of radioactivity from the cloud, then this area and others farther from Ground Zero might be dangerously contaminated. Even Village "Y" to the northeast of City X might become contaminated by the fall-out. The extent of the contamination depends so much upon meteorological conditions. About all one can say for certain is that areas which are downwind from Ground Zero would be the most likely to be contaminated.

It may be recalled that in the case of the Alamogordo test, some fall-out radioactivity did occur near the test site. Where the radioactive particulates adhered to the backs of cattle, the color changed and some of the cattle exhibited white backs.

The hazard from fall-out radioactivity, is, perhaps, more insidious than that of the primary flash. Unless instruments are used to warn

of the presence of radioactive material, people may stay within a contaminated area and continue to be exposed to the radiation.

In summing up the hypothetical bombing of City X, one can readily appreciate the magnitude of the disaster by estimating the total casualties occurring within the city. One can estimate that about 100,000 casualties would result if the city were typical of American cities as they exist today with no special defense plans or means of minimizing the extent of the disaster when the bomb was exploded.

Of these 100,000 casualties, about half would result in fatalities. The number of fatalities is estimated on the basis that no pre-existing plans were made for evacuation and treatment of the wounded. Both the number of casualties and fatalities would be a

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# Atomic Bomb

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strong function of the preparedness of the city's institutions to cope with a disaster. There would, of course, be a definite number of people who would be killed outright by blast or fire injury or who would receive a lethal dose of radiation. In any efficient preparedness plan the latter would have to be "written off" as hopeless cases.

The staggering figure of 100,000 casualties would mean that almost every family in City X would be directly affected by the explosion. Many civic leaders, key industrialists, and thousands of skilled craftsmen so necessary to wartime economy would succumb to the disaster. Thus while the Section B steel plants would still be intact and outlying factories would be untouched, the city's productivity would be crippled. The loss of the many small feeder industries within the city would still the assembly lines of the huge aircraft plants at Section A. Aircraft plants in common with many other types of industries are extremely complex organizations which depend upon the combined output of thousands of these feeder industries.

One may thus conclude that if the enemy could succeed in detonating an atomic bomb at Point Zero, then City X would be virtually knocked out. It is important to point out, however, that this knock-out depends upon a precision execution of the attack. Should the bomb be detonated at the wrong altitude or over a less critical part of the city, then the effect of the attack might be less than a knock-out blow.

## Possibility of an Underwater Burst

The second atomic detonation at Bikini demonstrated conclusively the unique effectiveness of the weapon as a radioactive poison or contaminant. An enormous quantity of water from the Bikini lagoon was hurled into the air. Mixed with this water were all the fission products which would normally (in an air burst) be dispersed in the stratosphere.

As the towering column of contaminated water shot upward by

the blast cascaded down upon the lagoon, the ships of the target fleet were drenched with the radioactive liquid. The author vividly recalls how he stood on the bridge of the sub-chaser closest to the lagoon and marveled at the poised magnificence of the outward rolling mist as it lunged across the target fleet. Within that mist was carried the equivalent radioactivity of thousands of tons of radium.

Some ships within the target fleet were so thoroughly saturated with fission products that they could not be boarded for several days. Even then extreme precaution had to be exercised and boarding parties were limited to a few minutes work on the ships. Months later some of these ships were still "hot" and presented a vexing problem to the Navy.

Suppose that the enemy in attacking City X decided to duplicate the second Bikini test by dropping the atomic bomb so that it would detonate in the lake about a mile off shore. Just what would happen to City X?

It is not possible to describe the effects of such an explosion as in the case of an air burst for it would seem that too much depends upon the circumstances under which the bomb detonates. The depth of the water would be important as well as the nature of the winds which prevailed at the time of the burst. Certainly the city would not suffer from any blast damage or from the heat flash. Both of these effects would be absorbed in the water. If the proper conditions were obtained then the radioactive fall-out or rain down upon the city might cause more fatalities than the air burst which has been described. No pattern for this damage can be prescribed. It would seem to the author that the use of the bomb in this way, that is, as a radioactive poison, may be an extremely effective use of the weapon but it is also subject to great uncertainty in its effect. Furthermore the detonation of the bomb in the Bikini lagoon is a far cry from an actual operation where it would be dropped from an aircraft.

Some publicity has been given to the possibility of exploding atomic bombs off the west coast of the

United States in order to contaminate the western states. In terms of the specific amount of radioactivity needed per unit area of land surface, this possibility is fantastically remote. One should carefully distinguish between detectable radioactivity and lethal amounts of radioactivity; the two differ by a factor of ten million.

## Atomic Bombing of Washington, D. C.

Let the city of Washington, D.C. be submitted for City X and see what the effects of the air burst previously described would be upon it. In the nation's capital are concentrated the executive, congressional, and military top agencies of the government. For an aggressor not to attack this critical city would be a military blunder of the worst type.

The selection of Point Zero for Washington, D.C. presents a complex problem and the author has simply assumed that the enemy would want to knock out the Pentagon building (headquarters of the National Military Establishment) as the target of the highest priority. In addition, the bomb might be detonated so as to inflict as much possible personnel damage throughout the rest of the city. Let it be assumed that the bomb is detonated at an altitude of  $\frac{1}{2}$  mile and that Ground Zero is taken as the Potomac River midway between the Highway and Memorial Bridges. Such a reference point would show up well on the bomber's radar screen.

One might say that such a choice of Ground Zero is not very prudent for within a circle 1 mile in diameter around this point are practically no buildings. However, within a radius of less than 1 mile from this point are the Pentagon, the Navy and Munitions buildings, the Treasury, and the New State Department building. Included also are the headquarters of the Atomic Energy Commission, the Department of the Interior, and the Department of Agriculture. All these could be expected to undergo almost complete destruction and the loss of life would probably be above 90%. Both the vital Memorial and Highway bridges would be destroyed.

Most of the other government buildings along the Mall as well as those surrounding the White House are within 1½ miles of Ground Zero and would all suffer heavy damage. Even the Capitol some 2 miles from Ground Zero would not escape; its huge structurally weak dome would collapse. Eight hospitals including the new George Washington University Hospital would be destroyed.

As a result of the detonation many Congressmen, high government officials, and key military officers would be killed. The leadership of the government would revert to those who remained alive in the nation's first city. Only a few of the twenty thousand workers in the Pentagon would be alive after the first day for the combined effect of the blast wave and radiation upon the building would be a knock-out blow. In fact, the grid-like design of the Pentagon with its many deep courts to admit sunlight would render it more susceptible to the effects of the atomic bomb. Some might whimsically recall that this mammoth structure was built by General Groves, the same man who headed the Manhattan Project.

Certainly the foregoing description of the effects of atomic attack leaves little room for doubt that the atomic bomb is a decisive military weapon. Anyone who surveys our large cities must admit that they are lush targets for atomic bombs. Thus an enemy nation possessing atomic weapons might be lured into attacking this nation by the very attractiveness of the targets.

#### Atomic Defense

Atomic scientists have said: "There is no military defense against atomic bombs and none is to be expected . . . Preparedness against atomic war is futile and, if attempted, will ruin the structure of our social order . . . There is no solution to this problem except international control of atomic energy and, ultimately, the elimination of war."

Since, however, most people will admit that there seems little hope of international accord, it would seem prudent to examine the first two statements rather carefully.

The atomic bomb is a new type

of weapon, in fact it is a triple-threat combination of a high explosive, a super-incendiary, and a radio-active poison. It is not something mysterious which can magically be pre-detonated or defused by radio waves, ultra-sonics, or other means. In this sense, then, there is no defense against the atomic bomb. But in the sense that it is a high explosive, an incendiary, and a source of radiation, it is obvious that one can intercept it before it reaches its target, provided the defensive forces are alerted and the interceptory devices are efficient.

It is beyond the scope of this article to discuss the problem of physical interception. Furthermore security restrictions would limit the treatment of the problem. Neither does the author feel free to discuss intelligence interception which might be effective against saboteurs.

In spite of the best efforts of the interceptory forces, it cannot be denied that a few bombs might get through to their assigned targets and be detonated successfully. However, some of the bombs could be prevented from getting to their targets by efficient defensive devices such as rocket-type proximity fused anti-aircraft barrage. The latter must be counted as a defense, if only a percentage-wise defense.

There should also be some discussion of passive defense meas-

ures. These fall into two categories: 1) Long-range city planning; and 2) Preparedness planning for catastrophes.

Under the first of these two categories, one would include proper city planning for fire breaks, suburban communication headquarters, well distributed hospitals, and a host of other considerations which would tend toward making the city less attractive as a target and more capable of recovery if attacked. No recommendation is made that "cities go underground" or that decentralization be mandatory. In most cases, the cost of such measures would be prohibitive and economically unsound. But wherever possible, the future development of the city should be aimed at avoiding further concentration of facilities within built up areas of the city. It would also seem highly desirable to encourage suburban developments and independence of facilities.

The whole program should not be regarded as an hysterical atomic defense project but rather as a modern adaptation of city growth to social conditions. An important part of this program would seem to be intensive social studies to understand the sociological "make-up" of cities and to determine how natural trends in decentralization may be stimulated.

(Continued on Page 26)

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# Atomic Bomb

(Continued from Page 25)

One can argue that once the bomb explodes, there is little defense against it. If, however, a well worked out preparedness plan can be implemented immediately after the detonation many thousands of lives may be saved. In effect, then, this minimization program serves as a passive defense measure.

A few examples of what may constitute parts of such a program may be cited. First, the city's fire fighting equipment could be modernized to operate over rubble strewn streets. Plans could be worked out for isolation of fires by means of fire breaks. Trained rescue workers could be organized to evacuate the injured. Medical men could be trained to deal with radiation sickness, if only to the extent that the hopeless cases could be rejected and aid given to those who might survive. Specially trained squads of policemen and postal employees could survey the city for radioactive contamination and mark off dangerous areas. If these and many more minimization measures could be put into effect

promptly once a city was bombed, it is the opinion of the author that in some cases casualties might be cut in half. Had there been relief forces immediately available at Hiroshima, thousands of lives would have been saved.

## Conclusions

A rather realistic picture has been presented to illustrate the probable effects of atomic attack upon an American city. The conventional air burst of an atomic weapon is characterized by finite range of damage and an approximate pattern of the destruction can be formed. On the other hand, the use of the atomic weapon as a radioactive poison is not characterized by such a range of action and cannot be as accurately described. It is, however, still finite in effect; the detonation of atomic weapons at great distances from target cities would not constitute effective military use of the bomb.

Passive defense measures designed to make American cities unattractive as targets and to expedite the recovery of these cities from the effects of atomic attack have been mentioned. It would seem that a preparedness plan to cope with an atomic attack upon American cities would achieve some success in minimizing casualties from bomb explosions. These measures would not be "a defense" against the atomic bomb but would be a means of minimizing the effects of the bomb once detonated. Furthermore, on a long range basis the conversion of our cities to a form consonant with modern problems of transportation et cetera would result in a decentralized city. Such cities would then be more immune to atomic attack.

While everyone hopes for a lasting peace and looks forward to the outlawing of war as a means of settling international disputes, the realization of these hopes seems quite remote. It would be folly to disregard any means of defense which provides even a small percentage of protection against atomic attack. Emphasis on these "last ditch" measures should not detract from a sustained concerted effort to outlaw warfare.

## Publish Wall Chart On Nuclear Physics

The important areas of nuclear physics are illustrated in a new series of six two-color charts which have been prepared by the Westinghouse Electric Corporation's School Service for use in classes in schools and colleges.

The first chart portrays ten basic particles important in nuclear physics, illustrating and describing the proton, neutron, alpha particle, beta particle, gamma ray, deuteron, positron, mesons, and the neutrinos. The second chart explains how nuclei are put together, depicting some 635 isotopes and 75 isomers. It also illustrates and explains mass defect, binding energy, and Einstein's mass-energy formula.

Natural and man-made nuclear reactions are depicted in the third chart which includes solar reactions, natural radioactivity, nuclear fission, as well as typical reactions induced by various kinds of atomic bullets. Chart No. 4 portrays eleven types of apparatus for detecting and inducing nuclear reactions including the ionization chamber, Geiger counter, Wilson cloud chamber, and modern atom smashers.

The fifth chart shows five areas for the useful application of atomic energy. The construction and operation of the atomic pile are described. Illustrations of tracers, research, medical therapy, and the atomic bomb are included.

The last chart covers the major theoretical, experimental, and engineering achievements in nuclear physics, pointing out 38 contributions, from the discovery of natural radioactivity and X-rays to the current developments.

Measuring 25 by 36 inches and made of heavy stock, the charts are accompanied by a 32-page book of valuable supplementary information. The price for the complete set is \$1.00.

My ambition is to be truly esteemed of my fellow men, by rendering myself worthy of their esteem.

—Abraham Lincoln

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## **Brookhaven Lab to Explore**

# **USES OF ATOMIC ENERGY**

Fundamental atomic research is being stressed in the new Brookhaven Laboratory to satisfy an "urgent need for much more information about this totally new, powerful and awe-inspiring phenomenon," a Yale physicist declares.

The studies recently begun at Brookhaven will carry over into the fields of biology and medicine, all the pure sciences and technologies will be stimulated and new inroads into research basic to power production will be opened, according to William W. Watson.

Mr. Watson, Professor of Physics and Chairman of the Department of Physics at Yale, discussed the Brookhaven Laboratory on the weekly radio program "Yale Interprets the News", over Station WTIC.

The Yale professor, one of the instigators of the Brookhaven project, explained that the laboratory plan was born in the summer of 1946 when Yale and eight other large universities of the northeast formed the organization called Associated Universities, Inc., a non-profit corporation to administer an atomic energy laboratory in this region under contract with the federal government.

The idea, he stated, came about when a group of scientists realized that despite the heavy concentration of scientists and industry in the northeast part of the country, no uranium nuclear-energy reactor had been constructed here. Encouragement from a high-ranking army official led to the creation of Associated Universities, Inc.

The laboratory, Mr. Watson said, was constructed at Upton, N.Y. because the War Department was just declaring Camp Upton surplus property at the time. It was sufficiently isolated, well developed and ready for immediate occupancy, he added.

Mr. Watson pointed out that persons residing in the vicinity of the new laboratory are safe. The health hazards are well known and "the protective measures taken are more than adequate," he said. Also, monitoring stations equipped with

sensitive detecting devices are placed in the surrounding area to check the intensity of energetic radiations. "No one will be endangered in the slightest from the Brookhaven operations," he asserted.

Discussing laboratory finances, Mr. Watson declared that the costs amount to some millions of dollars—"more than any one university could afford". He said, "In supporting this venture, the U.S. Atomic Energy Commission is following the dictates of the Atomic Energy Act."

While no military aspects of atomic energy will be studied at Brookhaven, the physicist stated that "There will undoubtedly be some research directed by the commission, and of course the military applications stressed at other installations, as well as applied science of all kinds, will benefit from this new knowledge."

Mr. Watson also told of some of the peace-time developments in atomic research. "Using radioactive tracer atoms which can be made in large quantities in a uranium reactor," he stated, "considerable has already been learned about complicated physiological reactions, and some therapeutic results have been attained."

The Yale professor also described Brookhaven's work in power production. He said that power is to be generated from the heat developed in the atomic pile now nearing completion. After changing hot air from the reactor into steam, the steam will be used to generate about half the electric power needed to run the reactor. He said that the process does not appear to be very efficient, but warned that one must "keep in mind that this is the initial power development in a new field."

Mr. Watson expressed the desire to see the atomic bomb under "effective international control." He said, "Used in quantity in another war, this bomb could destroy us all. But with the threat of atomic warfare removed, I am confident that as a result of many researches sim-

## **Southwest Research Institute Formed**

In response to many requests, Southwest Research Institute of San Antonio, an endowed, non-profit organization which undertakes scientific research projects for industry on a cost basis, has published a brochure delineating its functions and services.

The organization, which has offices in Houston and San Antonio and is negotiating for laboratory facilities in Houston to supplement its San Antonio units, recently acquired the services of Dr. Harold Vagtborg, internationally known industrial research authority, as president. Dr. Vagtborg, who built Armour Foundation of Chicago, and later established Midwest Research Institute of Kansas City, will assume his new duties with Southwest Research Institute on September 1.

The brochure declares that the Institute, founded by Tom Slick, Texas oil producer and rancher, is aiding the southwest, which is rapidly industrializing, to solve its technological problems in the same manner as Mellon, Batelle, Armour and Midwest institutes have contributed to industrial advances in the East. The monograph points out, however, that the Institute's services are not limited regionally to the southwest.

In addition to describing the facilities and operating methods of Southwest Research Institute, the brochure outlines the services performed by its sister scientific organizations, the Foundation of Applied Research and the Institute of Inventive Research, also non-profit units, and sets out how Essar Ranch, famed for its registered cattle and cross-breeding programs, provides an agricultural and livestock laboratory for all three.

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A great man shows his greatness by the way he treats little men.

—Thomas Carlyle

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ilar to the few I have mentioned, the abundant life can be made available to all in the atomic age just ahead."

## Laboratory Develops

# Lightweight Plastic Iron Lung

A model of a rubberized cloth or plastic sheet "iron lung" respirator which can be mass produced at low cost—and would be so compact and light in weight that it could be transported in a suitcase instead of truck or ambulance—has been developed at Yale University.

The model—which can be collapsed and folded up—has already been tested successfully at Yale on an experimental animal.

A man size respirator of this type has been designed and it is expected to be developed on a commercial basis.

The new type respirator is primarily for use in handling cases of infantile paralysis. If commercial development is successful, the cloth respirator will multiply many times over the availability of treatment of this type for poliomyelitis cases, since it can be produced for a fraction of the cost of the present heavy and rigid respirator.

The manufacturer of the new respirator for human beings will have several technical problems to solve: how to provide proper port-holes for patient care; how best to get a person in and out of the respirator; and whether to use it with a standard hospital bed or as a self-contained unit. Because these are problems of technology and not of pure research, their solution will be left for later development on the part of the manufacturer.

The two have been working on this project since last January. The idea for such a respirator was first conceived by Dr. Lamport as a result of his work at Yale during World War II on the pneumatic lever suit, an improved type of "anti-g" suit now increasingly being worn to prevent blackout of pilots of fighter planes maneuvering at high speeds.

The new type respirator employs the same principle of operation as the "iron lung"—when the muscles for respiration are paralyzed, as in poliomyelitis, life can be sustained by subjecting the patient to rhythmic negative pressure all over the body, except for the head.

Yale experiments have shown that a cylinder can be sufficiently rigid to serve as a respirator, even though it is composed of light weight rubberized cloth or pliable plastic sheeting so that it can easily be folded compactly into a suitcase for storage or transportation.

The model which was tested successfully is 32 inches long, is cylindrical in shape, and, when fully inflated, weighs less than two pounds. In structure, it is something like a thermos flask, with air-tight inner and outer walls, which sustain air pressure between them.

A plywood disc carrying a sponge-rubber neck piece seals one end of the inner cylinder and also includes tubes to measure the pressure and to permit evacuating the chamber. The two cylindrical impervious walls of the respirator differ from those of the thermos bottle in that they are interconnected by radial cloth partitions which extend the length of the cylinder.

These partitions are not attached to the air-tight material at the ends of the cylinder, so that air under pressure flows freely from a single inlet throughout the double-walled ring-shaped enclosure which corresponds to the "iron lung." It is the compressed air in this inflatable structure which makes it rigid enough to support the rhythmically produced vacuum within it.

The mode of evacuating the air-supported chamber to induce rhythmic respiration need not be different in the new model from the methods presently used, such as bellows, diaphragm, or vacuum pump with a flexible hose. If desired, a double-walled diaphragm or bellows can be driven by air pressure alone instead of by the usual electric motor.

Another model respirator of vinyl plastic sheeting was made on an electronic sewing machine but technically was not entirely satisfactory. This latter model, however, has considerable promise, because of the possibility of perfecting a completely transparent respirator, which would aid in nursing and medical care.



## Develop New Units For Pumping Acids

Faster, safer and more convenient removal of acids, alcohols, bleaches and other liquids from carboys is claimed possible with a New Electric Carboy Acid Pump, announced by the Belke Manufacturing Co.

Pumping speed is approximately 2 gallons per minute, depending upon liquid. Light weight (weighs only 11 pounds) and convenient handle afford exceptional ease in moving Belke Carboy Acid Pumps from one carboy to another. The pumps are furnished with a 110 V, 60 cycle, AC motor, and can be plugged into any standard electrical outlet.

As the Belke Acid Pump is slipped into the carboy the self-sealing rubber connection seals the carboy neck. Turning on the motor switch causes the compressor to build up air pressure in the carboy, quickly forcing a steady flow of acid out thru the pipe.

The flow of acid can be stopped instantly by pressing the "flow stop" lever which releases the air pressure in the carboy. A pressure release valve prevents the air pressure from going over 30 lbs.

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The machine which at first blush seems a means of isolating man from the great problems of nature, actually plunges him more deeply into them. As for the peasant, so for the pilot, dawn and twilight become events of consequence.

—St. Exupery, Wind, Sand, and Stars

## Research Begins at Northwestern on Design of Dam

Research under way at Northwestern University eventually may assist engineers in the design of more efficient dams, as well as develop new information on the availability of water from wells.

The project, under the direction of Prof. Philip C. Rutledge and Asst. Prof. Howard P. Hall, is being conducted in the soil mechanics laboratory of the civil engineering department at the Technological Institute on the Evanston campus.

The study of transient flow of ground water as, for example, the rate of development of seepage through earth dams and the rate of lowering of ground water around wells, has been sketchy in the past. The present investigation is expected to provide a clearer understanding of what actually does take place, and should permit, not only more economical design of flood control structures, but also more reliable analysis of water supply and drainage problems.

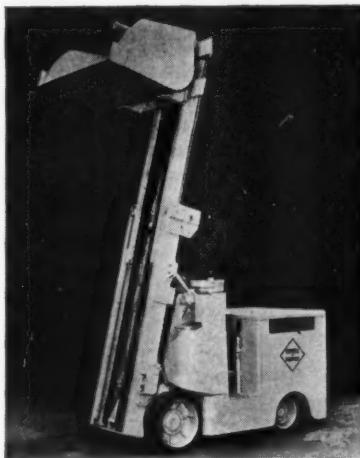
At present, the investigation is being limited to the effects of the raising and lowering of reservoir levels behind earth dams, although future analysis of the well and drainage problem are contemplated.

To study the unsteady flow of seepage in an earth dam, the engineers have constructed a model consisting of two trapezoidal glass plates mounted to simulate the cross-section of a dam. The space between the plates is very small (about 1/50th of an inch) in order to assure slow, smooth flow. Instead of using water, however, the scientists are employing a much more viscous, or "thicker," fluid to slow down the model test so that photographic records and measurements may be made.

Conditions of sudden filling, sudden lowering, and intermediate rates of change in water elevation are simulated by mechanical control of the fluid supply. The rate at which a steady flow condition

## Manufacturer Introduces

# INDUSTRIAL TRUCK-SCOOP



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An electric power industrial truck equipped with a special type of scoop is announced by Elwell-Parker Electric Co., Cleveland, O. This is for picking up, transporting, delivery or piling loose materials used in many manufacturing and construction operations.

The scoop is attached to the truck's tilting and elevating mechanism and all controls are centralized at the driver's station. A simple tripping device on the scoop provides for rapid discharge of the load. It also has a pneumatic snubber to cushion impacts. When the scoop is lowered to floor level it assumes its normal shoveling position. Providing for ready adjustment to local conditions, the truck's upright column may be tilted forward 5 degrees from perpendicular. For safe carrying of the load and to avoid spillage, the upright column

develops is measured, and from this and other data the rate of development of seepage in an actual dam may be determined.

According to the investigators, the model tests using the closely spaced glass plates and viscous fluid are a mechanical means of solving a mathematical problem which is so complicated that, to date, mathematicians have been unable to approach the exact solution.

may be tilted backward 15 degrees from perpendicular. Flexibility of the machine facilitates loading or emptying the scoop at floor levels or at any height up to 117 inches.

Capacity area of the scoop is 12 cubic feet; capacity weight of load is 2000 pounds. Speed of the truck with load ranges up to 5½ miles an hour.

The combination of lift truck and scoop is especially adaptable in plants or areas where bulk materials are handled, such as related to chemicals, paints, glass, cement, coal, sand; and also in metalworking industries where large quantities of metal chips and similar scrap must be moved.

The scoop is interchangeable with a standard type fork, thereby adapting the truck at any time to a still wider range of time-saving, load-handling purposes.

The greatest task before civilization at present is to make machines what they ought to be, the slaves, instead of the masters of men.

—Havelock Ellis

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## Tax Inflation Hits Highways

The federal "tax inflation" on the highway user now amounts to 129 per cent since 1941," announces Arthur C. Butler, director of the National Highway Users Conference.

Mr. Butler says that in the fiscal year ended June 30, highway users paid at least \$1,118,645,000 in emergency federal taxes on new cars, trucks, buses, motorcycles, gas, oil, tires, tubes, parts and accessories. The 1941 figure was \$488,227,948.

"The tremendous size of the federal tax inflation now in force against the highway user is shown by the fact that receipts from these taxes are up 14.6 per cent in the last year alone, and 129 per cent above those collected in 1941," Mr. Butler said.

He added: "These federal taxes on the highway user are not intended to go for roads, as do most state highway taxes. They go for general revenues of the government. Consequently, anyone who uses highway transportation is being specially taxed by the federal government without any special benefit in return. Hundreds of highway user groups have already urged Congress to repeal these taxes, which were adopted only as temporary, emergency levies.

"The emergencies that created these taxes are over. But through their continuation, and their effect on the cost of living, these taxes may themselves become a personal emergency to millions of highway users."

### Correction

In the S & C Electric Company ad appearing in the September issue, the wrong zone number is given. The correct address is

4433 Ravenswood Avenue  
Chicago 40, Illinois

## Architects Club Leases Headquarters, Resumes Activities

In response to the many requests that the Chicago Architectural Club resume its activities in the field of architectural education and advancement, the directors of the club have voted to return to active status, and have leased quarters at 431 North Clark Street. As a result of the war, the club had closed its quarters and went on an inactive status.

The Chicago Architectural Club was organized as a sketch club on March 12, 1885, for the purpose of furthering architectural development among those engaged in the profession, and was incorporated "not for profit" in 1887. The club is the oldest architectural organization in the country, and enjoys a colorful history of accomplishments by its members, which include most of the important architects in the city, and many who have reached fame in other parts of the country. The club's prize competitions have been many and varied in subject, from court house, city plan, bridge or airport design to perfume bottle stopper. Not only has the educational field of design been covered, but the club has sponsored courses in engineering of steel, concrete, trusses, heating, ventilating, specifications, and refresher courses for the State Board Exam. It has also conducted sketch classes in color, life, free-hand drawing, modelling in clay and sculpture.

The Chicago Architectural Club has sponsored an Annual Archi-

tectural Scholarship competition for foreign travel and study with a stipend of \$1,200, and has reached its 29th annual award. This was started in 1900 with funds donated by the late Daniel H. Burnham. Some of the scholarship winners have been N. Max Dunning, Birch Burdette Long, Thos. E. Tallmadge, C. Herrick Hammond, Pierre Blouke, and many other prominent architects. It is hoped that rapid progress will be made in re-establishing the scholarship.

The Board of Directors includes: Ralph F. Gross, President; Louis Pirola, Vice President; John C. Van Balen, Secretary; Roy Anderson, Treasurer, and William F. Thomsen and Thos. O. Menees, Directors. The quarters at 431 North Clark Street will be open evenings for information.

*EDITOR'S NOTE: The President, Mr. Gross, is an active member of Western Society, devoting much time to Civic Committee assignments.*

All property is raw material that has been shaped to uses by intelligent skill.—Henry Ward Beecher

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# Book Reviews

**On Subjects of Interest to Engineers**

## Fundamentals of Photography

By Paul E. Boucher, published by D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, 1946, 448 pp.—\$3.25.

This book is intended for use in colleges and as a text book for groups or individuals reasonably advanced in amateur photography who desire a more exact knowledge of the subject. It will also serve as a reference book for those generally interested in certain features of commercial or other phases of the work.

Some of the subjects treated are history of the camera, developers and fixing solutions, lenses, shutters, emulsions, development, printing, filters, enlarging, projection slides, toning and staining, color photography, ultraviolet, infrared and X-ray photography and motion pictures. The various processes and essential equipment are explained with richly illustrated and impartial comparisons of the merits and handicaps to be encountered in the products and processes commercially available. The chapters on color photography and motion pictures are particularly interesting. Precautions necessary to obtain special effects and better pictures are discussed. In order to maintain interest in study, a number of experiments are given together with references, tables and definitions of words and terms.

E. B., M.W.S.E.

## Coatings and Ink Resins

By Dr. William Krumbhaar, published by Reinhold Publishing Corporation, 330 West Forty-second Street, New York, 1947, 318 pp.—\$7.00.

Resins have become of relatively greater importance as essential ingredients for surface coatings, possessing qualifications such as weather resistance and superior appearance for application to aircraft, automobiles, boats, electrical equipment, furniture, locomotives, cars and numerous other articles. In like manner they are used in the production of special use inks such as magazine color inks, label and fabric marking inks and many others.

The field has spread so that in order to make a practical contribution to industry, the author has limited the scope of this book to those resin types which are in common use and with which he is in daily contact through development and production work. Resins discussed are pure phenol resins, rosin-modified phenolics and maleic, and copal type synthetics. Emphasis is laid on experience and technical skill, equipment and machinery, commercial aspects and the patent situation. The book is intended to serve the research technician, engineers and others interested in the manufacture and use of these special products. Those qualified in these respective fields will value the frank discussion of problems commercially encountered.

E. B., M.W.S.E.

## A Text-Book of Heat

By G. R. Noakes, published by Macmillan and Co., Limited, London, 1947, 469 pp.—\$3.00.

This book treats the subject of heat, its measurement, its use and the physical laws pertaining to it, in a thorough manner. Included are chapters on expansion of solids, liquids and gases, vapors and vapor pressures, work, heat engines, transference of heat, heat phenomena in the atmosphere and other kindred subjects. The treatment is primarily intended for students in science courses, but is accompanied with typical examples of practical uses. Each chapter is followed with a list of questions intended to fix the preceding expository matter in the student's mind. The language is unusually clear. The historical growth of the science is carefully established.

It will be noted that the book originated in England and this is brought out in some of the introductory matter which, together with an occasional reference peculiar to the standards of that country, might preclude its use as a standard text in America. But it will be found to be excellent for supplementary study and the engineer will appreciate its clear presentation.

E. B., M.W.S.E.

## Servomechanism Fundamentals

By Henry Lauer, Robert Lesnick and Leslie E. Matson, published by McGraw-Hill Book Company, Inc., New York, 1947, 277 pp.—\$3.50.

The term "Servomechanisms" has a variety of meaning to engineers. The root of the word (servo-slave) gives some explanation but the term has come to be applied almost entirely to such control and indication equipment as is known by the trade names of Selsyn, Teletorque and Diehlsyn.

A simple example is a synchro motor energized by three output voltages from a synchro generator with motor and generator being excited by the same single phase source. The rotor of the motor will orient itself to the same angular position as the shaft of the generator. It becomes apparent that here is a convenient method to transmit control or indication.

This book describes the many variations of this device with liberal mechanical analogies. Problems such as friction and damping are dealt with and the material is presented for complete design of this very useful "slave."

J. A. S., M.W.S.E.

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## BEG YOUR PARDON!

MIDWEST ENGINEER regrets that in listing the change of name of the J. W. Murphy Company to Meters and Controls, Incorporated, the members of Western Society who are associated with the firm were incorrectly listed. Mr. Thomas G. Robinson (M '47) is the only member of Western Society associated with the firm.

# National Hydraulic Conference

## Begins October 20

The fourth annual meeting of the National Conference on Industrial Hydraulics will convene October 20 and 21 at the Sheraton Hotel.

Planned to foster interchange of ideas and techniques in the field of hydraulics, the conference is sponsored by Armour Research Foundation and the Graduate School of Illinois Institute of Technology. Cooperating organizations are Western Society of Engineers, the Chicago sections of American Society of Mechanical Engineers, Society of Automotive Engineers, and the Illinois Section of American Society of Civil Engineers.

All conference technical meetings will be held in the "Gothic" Room, 3rd floor, of the Sheraton Hotel, 505 N. Michigan Avenue.

Registration opens Wednesday, October 20, at 8:30 a.m. Cost of all conference activities will be \$18.50, covering registration fee, proceedings, dinner and luncheon tickets and attendance at technical sessions.

### Wednesday's Program

The programs will begin at 9:45 a.m. Wednesday, October 20, with opening remarks by H. A. Leedy, Director, Armour Research Foundation.

The morning technical session on Wednesday will begin at 10 a.m. The subject will be "Recent Applications." Mr. Oliver K. Kelly, of General Motors Corp., Detroit, will present a paper on "The Poly-phase Torque Converter," and Mr. J. F. Ziskal, International Harvester Co., Chicago, will present a paper on "Hydraulic Circuits for Farm Tractors." Mr. J. T. Greenlee, Imperial Brass Mfg. Co., is the chairman.

Mr. W. A. Lewis, Dean of the Graduate School, Illinois Institute of Technology, will speak at the Wednesday luncheon session, at 12:30 p.m. in the Boulevard Room. He will discuss briefly the background and the aims of the conference and will introduce the presi-

dents of the local technical societies who will speak on their own society's relationship to the conference. The presidents are: Mr. George S. Salter, A.S.C.E.; Mr. W. H. Oldacre, A.S.M.E.; Mr. V. O. McClurg, W.S.E.; Mr. H. E. Churchill, S.A.E.

Subject of the afternoon technical session on Wednesday, beginning at 2 p.m., will be "Hydraulic Components." The papers to be presented are as follows:

"Flanged Joints—Their Developments and the Trend," by E. G. Schmidt, Crane Co., Chicago; "Hydraulic Packings and Seals," by C. E. Schmitz, Director of Engineering, Crane Packing Co., Chicago; "Gasket Design and Selection," by H. H. Dunkle, Johns-Manville Corp., New York.

Chairman of the afternoon session will be Mr. B. A. Parks, Crane Co., Chicago, Ill.

Continuing Wednesday's program, a social hour will begin at 6 p.m. in the Boulevard Room, and the banquet will begin at 7 p.m. in the same room. Mr. R. E. Gillmor, Vice President of the Sperry Corporation will be the evening's speaker. His address, "Our Economic Missions in Europe," will be especially timely because, as an expert in industrial hydraulics, he was borrowed by the U. S. State Department a year ago to make a study of industrial conditions abroad. His recent return from this assignment enables him to make an authoritative report from the viewpoint of the engineer.

This dinner session will be a joint meeting with the Western Society of Engineers, the Chicago Section of The American Society of Mechanical Engineers, and the Illinois Section of American Society of Civil Engineers. Those who wish to attend the social hour and dinner meeting only, may make a separate reservation, in which case the registration fee is not required.

### Thursday's Program

The morning technical session on Thursday, October 21, on the subject, "Pumps and Turbines," will

begin at 9:30 a.m. Chairman is Mr. T. M. Niles, Greeley and Hansen, Chicago. Papers will be presented as follows:

"Recent Developments in Hydraulic Turbine Design and Manufacture," by J. F. Roberts, Manager, Hydraulic Department, Allis-Chalmers Manufacturing Co., Milwaukee.

"Hydraulic Surges in Pump Discharge Lines," by S. Logan Kerr, Consulting Engineer, Philadelphia.

"Predicting Liquid Jet Pump Performance," by R. G. Folsom, Professor of Mechanical Engineering, University of California, Berkeley, Calif.

The luncheon session, will begin at 12:30 p.m. in the Boulevard Room. Mr. R. R. Mitchell, General Motors Corporation, will present the purposes and aims of the standardization movement being sponsored by the "Joint Industry Conference on Hydraulic Standards for Industrial Equipment," and Mr. James Robinson, Chief Engineer, Vickers, Inc., will discuss standardization from the standpoint of the machine tool builders. The Joint Industry Group is composed of representatives of the automotive industry, machine tool builders, hydraulic equipment manufacturers.

"Servomechanisms," will be the subject of the afternoon technical session, starting at 2:30 p.m. Mr. C. J. Clark, Ingersoll Rand Co., Chicago, will be chairman.

The following papers will be presented: "Commercial and Industrial Application of Hydraulic Servo-

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mechanisms," by Walter Ernst, Vice President and Director of Engineering, Commonwealth Engineering Co. of Ohio, Dayton, Ohio; "Measurement of Hydraulic Machinery Performance as it pertains to Servomechanisms" including demonstration by Donald Campbell, Assistant Professor of Electrical Engineering, M. I. T., Cambridge, Mass.

Mr. Victor L. Streeter, Illinois Institute of Technology, is Conference Director, and Mr. S. F. Musselman, also of I.I.T., is Conference Secretary.

The world's greatest thinkers have often been amateurs; for high thinking is the outcome of fine and independent living, and for that a professorial chair offers no special opportunities.

—H. E., The Dance of Life

## President Appoints Lawrence

Miss Clara Lawrence, Affiliate, WSE, and member of the Professional Women's Council, has been appointed to the President's Committee on National Employ of Physically Handicapped Week, which is being observed October 3 to 9.

She is serving with Dr. Charl Ormond Williams, Director of Field Service, National Education Association, on the essay contest section of the committee. The purpose of the essay contest, open to grade and high school students, is to stimulate their thinking and comprehension of the problem of the 28,000,000 physically handicapped persons in this country, and also that of their teachers and families. The committee feels that if the younger generation can be brought to a point of understanding and proper evaluation of the handicapped, then future programs will be greatly accelerated in all fields of treatment, training and placement of the handicapped.

Miss Lawrence is a past president of the Evanston Club and of the State Federation of Business and Professional Women's Clubs, Inc. She is corporate secretary and assistant corporate treasurer of Wm. B. Lucke, Inc. of Wilmette, Illinois.

# WSE Applicants

In accordance with the By-laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Junior, Member, Associate, etc.

All applicants must meet the highest standards of character and professionalism in order to qualify for admission, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office.

- 53-80 Mack W. Benkler (Rein.), Mechanical Engr., I. L. Wise, 9 S. Clinton St.
- 54-80 George W. Kohout (Trsf.), Structural Designer, Div. of Water Works Design, City of Chicago, City Hall.
- 55-80 Lester M. Ferguson, Designing Engr., Sinclair Refining Co., East Chicago, Ind.
- 56-80 Jed J. Merrill, Field Engr., A. M. Byers Co. (Pittsburgh, Pa.), 135 S. La Salle St.
- 57-80 James Whelan, President, Hansen & Petersen Co., 206 S. Desplaines St., Joliet, Ill.
- 58-80 J. B. Armstrong, Office Engr., Powers-Thompson Construction Co., 27 S. Chicago St., Joliet, Ill.
- 59-80 George M. Albright, Chief Engr., Powers-Thompson Construction Co., 27 S. Chicago St., Joliet, Ill.
- 60-80 Clinton H. Hubbell (Trsf.), Mechanical Engr., Sauerman Bros., Inc., 522 S. Clinton St.
- 61-80 Asbury L. Spencer, Gen'l Mgr. & Chief Engr., S. N. Nielsen Co., 3059 W. Augusta Blvd.
- 62-80 Frank W. Edwards, Director, Dept. of Civil Engrg., Illinois Institute of Technology, 3300 Federal St.

63-80 Maurice Q. Acott, Cable Foreman, Western Union Telegraph Co., 1029 W. Adams St.

64-80 Fred W. Neubauer (Rein.), Sales Engr., Standard Oil Co. (Ind.), 20 N. Wacker Dr.

65-80 Alphonse M. Westenhoff, Engr. of Construction, New York Central System—Lines West of Buffalo, 425 LaSalle Street Station.

66-80 Robert H. Hill, Chief Engr., Stewart-Warner Corp., 1826 Diversey Pkwy.

67-80 David C. Peterson, Director of Engrg., Stewart-Warner Corp., 1826 Diversey Pkwy.

68-80 James S. Knowlson, Chairman of the Board & Pres., Stewart-Warner Corp., 1826 Diversey Pkwy.

69-80 Charles F. Raisch, Eng. Consultant, Stewart-Warner Corp., 1826 Diversey Pkwy.

70-80 Harry R. Tear, Research Engr., Stewart-Warner Corp., 1826 Diversey Pkwy.

71-80 Edward W. Medbery, Mill Manager, Fieldcrest Mills, Zion, Ill.

## E. R. GRITSCHKE

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# WSE Meeting Dates

1948

- October 11 Fire Protection and Safety Engineering Section
- October 18 Electrical Engineering Section
- October 25 Annual Fall Dinner
- November 1 Communications Engineering Section
- November 8 General meeting sponsored by Hydraulic, Sanitary & Municipal Engineering, and Traffic Engineering and City Planning Sections
- November 15 Mechanical Engineering Section
- November 22 Chemical and Metallurgical Engineering Section
- November 29 Gas, Fuels and Combustion Engineering
- December 6 Hydraulic, Sanitary and Municipal Engineering Section
- December 13 General meeting sponsored by: Mechanical Engineering and Fire Protection and Safety Engineering Sections

1949

- January 10 General meeting sponsored by Electrical Engineering and Communications Engineering Sections
- January 17 Traffic Engineering and City Planning Section
- January 24 Transportation Engineering Section
- January 31 Bridge and Structural Engineering Section
- February 7 Fire Protection and Safety Engineering Section
- February 14 Electrical Engineering Section
- February 21 Washington Award Dinner (tentative)
- February 28 Communications Engineering Section
- March 7 Gas, Fuels and Combustion Engineering Section
- March 14 General meeting sponsored by Bridge and Structural Engineering and Transportation Engineering Section
- March 21 Chemical and Metallurgical Engineering Section
- March 28 Mechanical Engineering Section
- April 4 Hydraulic, Sanitary and Municipal Engineering
- April 11 General meeting sponsored by Chemical and Metallurgical Engineering and Gas, Fuels and Combustion Engineering Sections
- April 18 Traffic Engineering and City Planning Section
- April 25 Transportation Engineering Section
- May 2 Fire Protection and Safety Engineering Section
- June 6 Annual meeting



## News of Western Society

The first general meeting of Western Society, November 8, will feature Mr. Walter J. McCarter, General Manager of the Chicago Transit Authority, who will speak on "Chicago's Future in Mass Transit." Mr. McCarter will discuss plans of CTA to improve Chicago transit facilities and will report on the progress to date.



**Walter J. McCarter**

Mr. McCarter is nationally recognized in the transit industry for his progressive policies. He formerly served as head of the Cleveland Transit System. Graduating from Purdue University in 1921, he became a student engineer with the Milwaukee Electric Railway and Light Company and served there in various capacities before moving on to the Cleveland assignment. He pioneered there in the establishment of new service techniques, premium fares for special services and better labor and "owner-rider" relationships. He brings to the CTA a record of tested experience.

Sponsors of the meeting will be the Hydraulic, Sanitary and Municipal Engineering, and Traffic Engineering and City Planning Sections.

### Fire, Safety Section

Speaker at the October 11 meeting of the Fire Protection and Safety Engineering section will be John J. Ahern, Director of the Department of Fire Protection and Safety Engineering of Illinois Institute of Technology. Mr. Ahern, a member of Western Society, will present an eye-witness account of a recent disastrous fire in Chicago, and he will be followed by an engineer of the Associated Factory Mutual Fire Insurance Company, who will speak on "Explosion Hazards in Auxiliary Processes."

### Communications Section

Mr. Erwin M. Roschke, will speak before the Communications Section, November 1, on the subject, "Recent Television Developments."

Mr. Roschke has been a member of the Zenith Radio Corporation's Engineering Department since January, 1946. During the preceding four years he was with the Bell Telephone Laboratories where he did research and development work on radar and pulse communication systems. He has a Bachelor of Science degree from Valparaiso University, and a Master of Science from Purdue University, both in electrical engineering.

Mr. Roschke will discuss recent developments in the rapidly moving television industry. He will cover some problems of a general nature as well as development work done at Zenith on Phonevision.

# FUTURE EVENTS

## Famous Newspaper Columnist to Speak at Annual Dinner

We have been fortunate in obtaining the services of Robert J. Casey, internationally famed war correspondent, newspaper columnist, editor, commentator, and explorer, for the annual fall meeting which will be held at the Furniture Club of America on October 25.

Mr. Casey's wit and his ability to present his observations on current affairs have been a by-line throughout the world press. As a Chicagoan he has endeared himself to the hearts of the millions of people who have read his articles and books.

His brilliant repartee is well known and no one can afford to miss what promises to be a most interesting and humorous dissertation.

We asked Mr. Casey what his topic was to be and he said, "You should have better sense than to ask me that. Tell them (W.S.E. membership) that I'll try to explain 'what's wrong with the world, in four easy lessons.'

Ladies are invited and we urge you to make your reservations early using the reservation form below.

The dinner will be at 6:30 p.m. promptly and arrangements will be made for a fellowship hour beginning at 5:30. Please note that the entrance to the Furniture Club is not on Lake Shore Drive but is at 667 No. McClurg Court.

"The man who strives to educate himself—and no one else can educate him—must win a certain victory over his own nature. He must learn to . . . question his presuppositions, and take his chances with the truth. The greater the need of education, the stronger the resistance to it."

—Martin, *The Meaning of a Liberal Education*

## DINNER SPEAKER



Robert J. Casey

## Junior Meeting

The Junior Division will discuss "Psychological Factors That Make a Good Executive" in their first meeting this fall Thursday, October 7, in the new rooms of the WSE.

## Women's Council

The Professional Women's Council meeting dates have been changed, and the first meeting will now be held at Western Society headquarters on Friday, October 15.

Other dates will be as follows:

1948

Friday, October 15

Thursday, November 11

Thursday, December 9

Thursday, January 13

1949

Wednesday, February 9

Wednesday, March 9

Wednesday, April 13

Wednesday, May 11

Wednesday, June 8

at 84 E. Randolph St. at 7:00 p.m.

This will be the first of a series of seminar-type meetings which proved to be very successful last year. The moderators will be associates of Social Research Incorporated. These men who are well versed in the field of industrial psychology will discuss the question "What is a good executive like?" All members and friends of the Junior Division are encouraged to join in this discussion.

## ANNUAL FALL DINNER

Monday

October 25, 1948

6:30 P.M.

Furniture Club of America  
667 No. McClurg Court  
Fellowship 5:30-6:30

To the Secretary, Western Society of Engineers  
84 E. Randolph Street

ENCLOSED IS REMITTANCE OF \$..... for ..... Tickets.

Tickets, \$3.95 inc. tax and tip.

Tables will be reserved for this meeting.

Date.....

Signed.....

Address.....

Make checks payable to the Western Society of Engineers

No refunds made after 1 p.m., October 25



## Activities of Membership Committee

We don't know whether the fellow shown in the cartoon above is a mountaineer or whether he symbolizes the tortoise and hare race, but you'll see in his hand an application blank, and we are surely anxious to know what he's going to do with it.

The general idea is that he should be moving along the road to 600 new members of WSE. We'd like to

have a caption for this cartoon, and we'll reproduce it from time to time for the purpose of indicating what gains have been made.

In the September issue of MIDWEST ENGINEER we told you about the 524 new members gained in 1947-48, and now in this 80th fiscal year the membership committee has an objective of a gain of 600 new members.

## Civic Committee Schedule Listed

Meeting dates for the Civic Committee are as follows:

### 1948

Thursday, October 21  
W.S.E. Headquarters—7:00 p.m.  
Thursday, November 4  
W.S.E. Headquarters—7:00 p.m.  
Thursday, November 18  
W.S.E. Headquarters—7:00 p.m.  
Thursday, December 16  
W.S.E. Headquarters—7:00 p.m.

### 1949

Thursday, January 20  
W.S.E. Headquarters—7:00 p.m.  
Thursday, February 10  
W.S.E. Headquarters—7:00 p.m.  
Thursday, March 10  
W.S.E. Headquarters—7:00 p.m.  
Thursday, March 31  
W.S.E. Headquarters—7:00 p.m.  
Thursday, April 21  
W.S.E. Headquarters—7:00 p.m.  
May Dinner Meeting—Date Open

Remember, there are 10,000 potential members in the Chicagoland area and we again urge each of the members of the Society to be responsible for at least one new member.

Notice in the Future Events column the announcement of the annual dinner to be held October 25. Here's an opportunity to introduce prospective members to the Society.

Note also the WSE programs scheduled, and we urge that all those attending bring a guest who may be a prospective member.

There are so many interesting developments in the Society's activities which you can pass on to prospective members such as the headquarters facilities, the new magazine, the growth of the Society, social and professional contacts, participation in civic affairs in Chicago, the John Crerar Library facilities, and the lasting friendships and acceptable camaraderie obtained in an engineering and science center which provides a mutual ground for engineers and scientists.

Herman Ross, Chairman  
Membership Committee

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Company \_\_\_\_\_

Position \_\_\_\_\_



# A. I. E. E.

**American Institute of  
Electrical Engineers**

The Chicago Section of the American Institute of Electrical Engineers will hold 22 meetings during the season 1948-49 at the new 84 E. Randolph Street location of the Western Society of Engineers. The meetings are held on Thursday evening, with pre-meeting movies at 6:30 p.m. and the main subject at 7:00 p.m. Three general dinner meetings will be held in the Stevens Building Restaurant at which prominent engineers will be the guest speakers.

The meetings scheduled for the month of October are:

October 7, 1948: Subject: "Practical Experiences with Resonant Neutral Grounding in a Large 34.5 Kv System." Presented by Mr. Harold H. Brown, Chief Electrical Engineer, Wisconsin Michigan Power Company, Appleton, Wisconsin. Mr. Brown has been engaged in the electric utility industry for nearly 30 years and is well known as the author of several technical papers. This lecture will deal with the practical side of ground fault neutralizer applications in a manner that should be of great interest to all members. The lecture will be illustrated with slides.

October 14, 1948: Subject: Modern Theories of Conduction of Electricity" or "Why Electrons Stray from Home." Speaker: Dr. Karl K. Darrow, Research Physicist of the Bell Telephone Laboratory, New York, N.Y. Dr. Darrow is well known in the field of Basic Sciences and has spent many years in the development and investigation of modern theories.

October 28, 1948: Subject: "Nucleonics" by Dr. Lyle B. Borst, Chairman, Nuclear Reactor Project, Brookhaven National Laboratory, Associated Universities Incorporated, Upton, Long Island. Dr.

Borst will present many facts of interest in the Electronics field.

Later dates assigned for meetings of the American Institute of Electrical Engineers are:

1948

November 4, November 18, December 9, December 16

1949

January 6, January 13, January 20, February 10, February 17, February 24, March 3, March 10, March 24, March 31, April 14, April 28

## WSE Junior Division Schedule

The following program schedule has been set for the 1948-49 season of the Junior Division.

1948

October 7	Engineering Psychology	Social Rooms
November 2	"Kick-Off Dinner"	Engineers Club
December 2	Patent Law	Social Rooms

1949

January 6	To Be Announced	Social Rooms
February 3	Charles Ellet Papers	Social Rooms
March 3	To Be Announced	Social Rooms
April 7	To Be Announced	Social Rooms
May 9	General Social Meeting	Social Rooms

Speaker at the "Kick-Off Dinner" will be John P. Carmichael, sports authority on the staff of the Chicago Daily News.

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—James Allen

# *Juniors Feature Sports Editor at Annual Dinner*

Activities of the Junior Division for 1948-49 will officially begin with the first annual "Kick-Off Dinner" planned for the Engineers Club, Tuesday evening, November 2, 1948, at 6:45 P.M.

Although the fall program of the Junior Division opened in the Society headquarters earlier this month with an exceptionally fine seminar on "Engineering Psychology," the November meeting has been scheduled as the official "Kick-Off" meeting for a year packed full of activities. To broaden the acquaintance of the General Society with the activities of the Junior Division, all members of the society are invited to attend this dinner meeting. Those who cannot attend the dinner are encouraged to drop in for the social portion of the program starting at 8:00 P.M. As this invitation is being extended to the student chapters and their friends, it promises to be a meeting well representative of the Western Society membership and interest.

## **Theme to Be Sports**

The theme of the November meeting will, of course, be sports, highlighted by a review of the 1948 baseball season and observations of the present football season. John P. Carmichael, noted Sports Editor of the Chicago Daily News, will be the guest speaker. Mr. Carmichael and his "Barber Shop" column are no strangers to midwest sports followers. Born in Madison, Wisconsin, a student at Campion College and the University of Wisconsin, John P. Carmichael has been in newspaper work for 24 years, having started on the Milwaukee Journal and moving to the Milwaukee Leader before coming to Chicago. In 1932 he came to the Chicago Daily News from the sports desk of the Herald and Examiner and has moved steadily forward in sports writing until he is recognized today by newspaper men and veteran baseball executives across the nation as tops in his field. His "Barber Shop" column, popular from its inception in 1934, has become in the last decade one of the best known sports columns in the nation. Carmichael's endless travels in search of sports material have taken him to all parts of the country. His



**John P. Carmichael**

acquaintancehip among leading sports figures is regarded as the largest in the world of sports journalism. His baseball, football, prize fight and Kentucky Derby stories have been remarkable for their accuracy and human interest. Carmichael has been cited by Connie Mack as his "favorite sports writer," and hailed by James T. Farrell, noted novelist, as "the best baseball writer in America today." Carmichael has been Sports Editor of the Chicago Daily News since May 6, 1943.

We are sure that you will not want to miss this informative and entertaining evening. Plan now to attend. Remember, if you cannot make the dinner, feel free to drop in later for Mr. Carmichael's speech and the social portion of the program and the refreshments.

### **Deadline for Reservations**

October 29, 1948

Dinner Reservations: \$2.50—Make yours now!

Use the blank opposite and mail to:

Western Society of Engineers  
"Kick-Off Dinner"  
84 E. Randolph Street  
Chicago 1, Ill.

### **JUNIOR DIVISION**

### **ANNUAL "KICK-OFF" DINNER**

No. of Reservations \_\_\_\_\_ Check Enclosed \_\_\_\_\_

.....Dinner at the Engineers' Club \$.....  
at 6:45 p.m., Tuesday,  
November 2, 1948

Send Tickets to:

.....  
.....

**A.I.E.E.**

# *Education Program*

The Chicago Section of the American Institute of Electrical Engineers announces the 1948-49 Educational Program which is open to members of the Western Society of Engineers, the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and to the public. All members of these organizations are eligible to enroll in the courses at member rate.

These courses are offered primarily for the professional engineer, who being out of school does not have the opportunity to attend regular college classes. The program is in no sense meant to compete with the excellent engineering and technical schools in the Chicago area.

Four courses are scheduled, with classes beginning on October 12th at the Western Society headquarters. In the field of human relationships, a course in Principles of Supervision is being added to complement the Business Relationships course which is being repeated. The English courses are being expanded to include two eight-session courses; one in English and Letter Writing, and the other in Report Writing.

The Chicago Bar Association is cooperating in the planning of a course in law concepts and fundamentals to be given in the spring.

#### **COURSE NO. 1**

#### **THE PSYCHOLOGY OF GETTING ALONG WITH PEOPLE IN THE BUSINESS WORLD.**

Five Sessions

This is the fundamental course which was given three times last year. It deals in basic principles of achieving mutually satisfactory working relationships. The instructor is again Mr. W. K. Burchard, head of the Engineering Training Department of the Illinois Bell Telephone Company.

Time: Tuesday evening, 7 to 9 p.m., October 12 to November 9, inclusive.

Place: Western Society headquarters, 84 East Randolph Street.

#### **COURSE NO. 2**

#### **BASIC PRINCIPLES OF SUPERVISION**

Eight Sessions

This course deals in the theory of supervision emphasizing personnel factors rather than the technical. It will include such subjects as job planning, handling cases of dissatisfaction, improving individual production, and safety. The instructor is Mr. W. K. Burchard, Illinois Bell Telephone Company.

Time: Tuesday evening, 7 to 9 p.m., November 16 to January 4, inclusive.

Place: Western Society headquarters, 84 East Randolph Street.

#### **COURSE NO. 3 BUSINESS ENGLISH AND LETTER WRITING**

Eight Sessions

A comprehensive course devoted to a review of grammar, punctuation, and diction as related specifically to business letter writing. At least half of the sessions will deal with actual business letters—their form, style, and content. The course is an expansion of the one presented last spring. Mr. H. E. Clarkson, Northwestern University instructor, business letter consultant, and lecturer, will again be the instructor.

Time: Wednesday evening, 7 to 9 p.m., October 13 to December 1, inclusive.

Place: Western Society headquarters, 84 East Randolph Street.

#### **COURSE NO. 4 REPORT WRITING**

Eight Sessions

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Time: Wednesday evening 7 to 9 p.m., December 8 to January 26, inclusive

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# PICTORIAL PROGRESS REPORT ON **WSE Headquarters**



**Photo of 84 E. Randolph Street from the southeast corner of Randolph and Michigan avenue. Looking west in Randolph street, the new headquarters building is located immediately west of the Crerar Library, the large building in the foreground.**

(Photo taken Winter, 1947-48)

Just about a year ago Western Society of Engineers placed in the hands of all its members an encouraging and forward-looking story about the establishment of an Engineering and Science Center in Chicago.

This little booklet was entitled, "Toward a New Horizon," and it told about the aims and objectives of WSE. In our previous publications—the Bulletin and the Journal—as well as in various meetings during the past year, the story of our new headquarters has been told many times. So many folks have been inquiring about the structural progress being made on the 5th, 6th and 7th floors—and we have attempted to draw a word picture—but the increasing demand for a visual perception of what was taking place at 84 East Randolph Street has prompted a photographic report of what has been accomplished as of September 15—the day the pictures were taken. On these pages are illustrated the views of the headquarters facilities. We hope to continue regular reports of this nature until the headquarters are finished.

Now that you can envision the structural changes being made in your Society's new headquarters, and with the realization that, completely finished, they will cost nearly 100 thousand dollars, every member of WSE should send in a contribution **NOW** to help defray the cost of these structural changes—and of the furnishings that will be necessary.

## SUBSCRIPTION BLANK

### THE WESTERN SOCIETY OF ENGINEERS

*To the Development Committee: I desire to contribute the sum of \$\_\_\_\_\_ toward the expense to be incurred in the expansion program associated with moving our headquarters to the Crerar site, 84 East Randolph Street, on April 1, 1948. My contribution will be:*

- In full herewith.
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Signature

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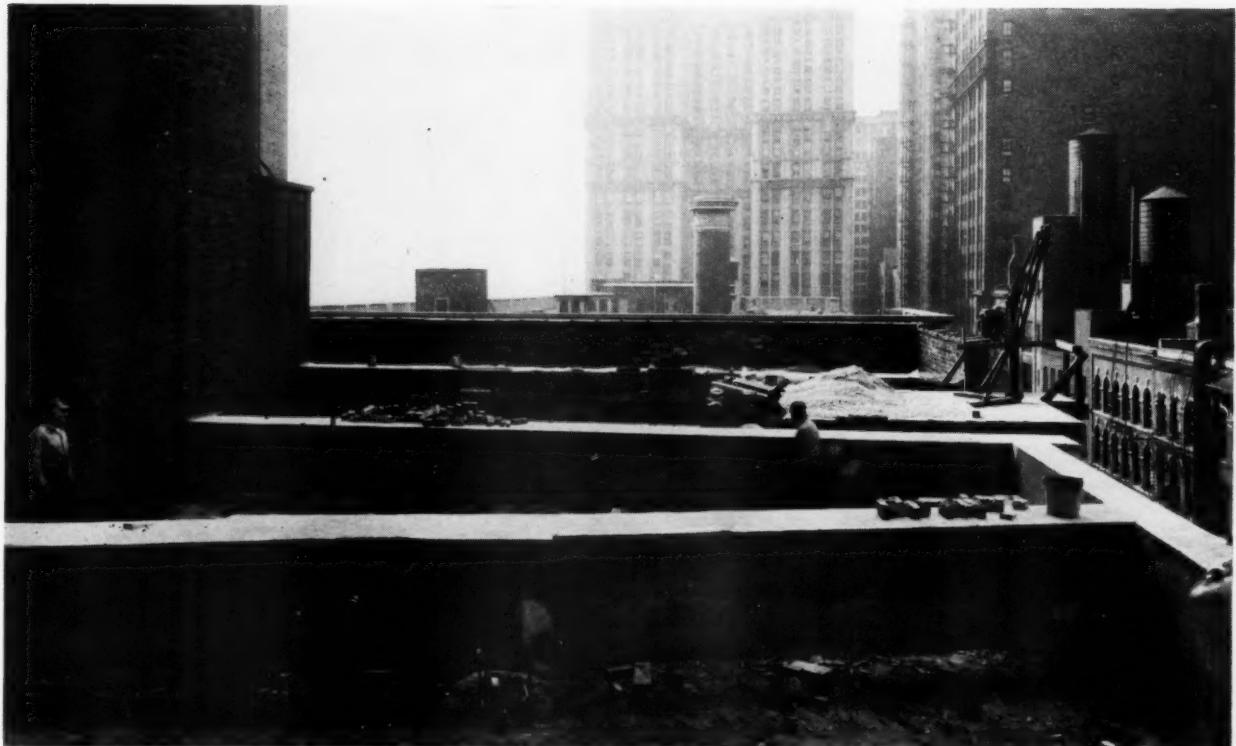
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The Western Society of Engineers



View showing portion of large seventh floor meeting room (capacity 200 persons). The ceiling support posts have been removed, at the time we go to press, to afford a clear view of the stage which will be erected against the north wall pictured beyond the scaffold.



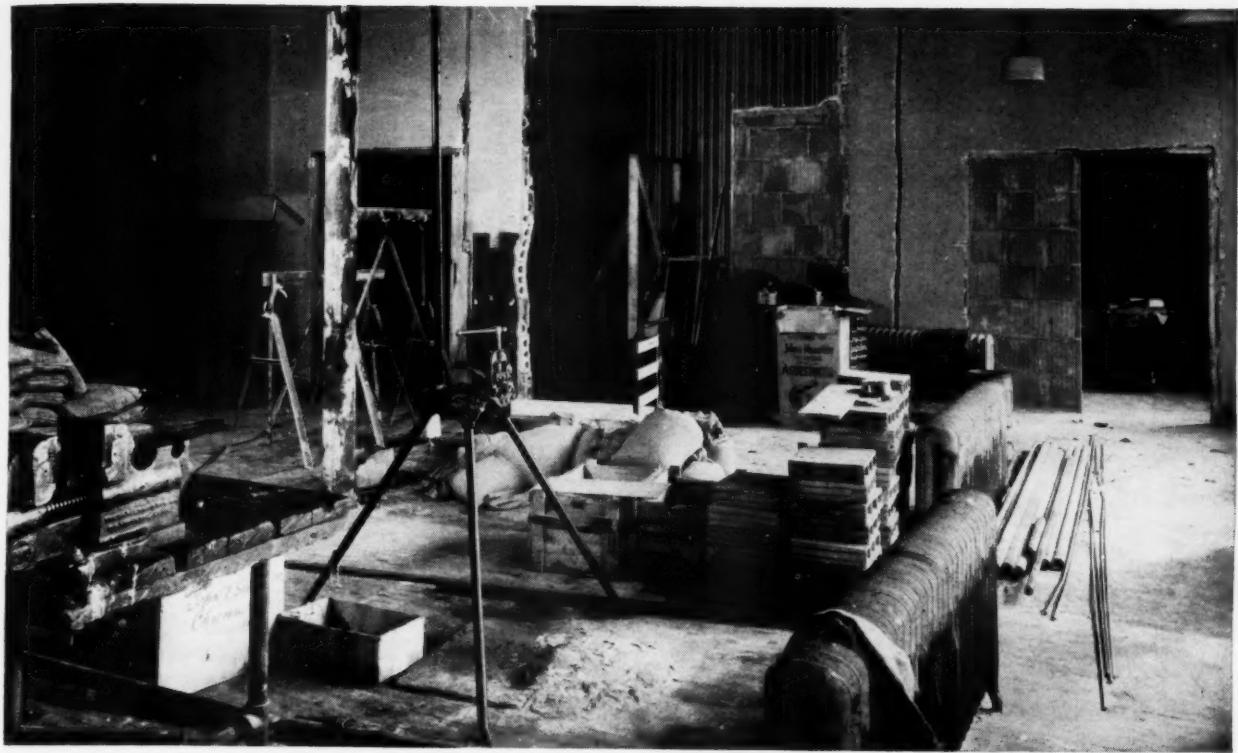
Looking south on the roof of the building showing the three massive reinforced concrete beams supporting the seventh floor ceiling.



Here is the space where the dining room will be located. This picture, looking north, on the fifth floor, shows the drop ceiling and opening into kitchen.



View of sixth floor lounge area looking south.



Looking east in area to be used for small seventh floor meeting room (capacity 100 persons). Entrance to conference room is seen at right.



This picture, taken from the "work" room, shows the sixth floor office area. The office at the left, on the west wall, is the secretary's and on the right will be the editorial office.

# Engineering Societies Personnel Service Report



Mr. Joseph Decker interviewing applicant in newly completed E.S.P.S. offices.

For more than thirty years E.S.P.S. has served the engineering profession,—matching position specifications of employers with experience and skill of engineers in every field.

E.S.P.S. is established as a non-profit organization to provide an employment service for engineer, employer, and employee alike. More than 50,000 engineers, members and non-members of the societies, have found positions and many thousands of companies have been served.

The Personnel Service is sponsored by the American Society of Mechanical Engineers, American Society of Civil Engineers, Amer-

ican Institute of Mining and Metallurgical Engineers, American Institute of Electrical Engineers, Society of Naval Architects and Marine Engineers, Engineering Society of Detroit, Engineers Club of San Francisco, and The Western Society of Engineers.

Activities of the Chicago office are guided by the Chicago Advisory Committee. It is the function of the committee to recommend expenditures, operational changes and such other matters as have important bearing on the employment service to engineers in the Chicago area, comprising fourteen states. Joseph R. Decker was recently appointed manager. Thomas Wilson,

previous manager and now retired, was well known, and had served engineers in this area long and faithfully.

"A revised method of registration to facilitate placement is now being accomplished and will require the cooperation of every engineer registered with the service," said Mr. Decker.

The following engineers are members of the Chicago Advisory Committee:

Dean O. W. Eshbach, A.I.E.E., Chairman, Northwestern University.

John F. Seifried, A.S.C.E., Ceco Mfg. Co.

J. N. Stanbery, W.S.E., Illinois Bell Telephone Company.

C. C. Austin, A.S.M.E., Goodman Mfg. Co.

W. S. Lienhardt, A. I. M. M. E., Metal & Thermit Co.

Joseph R. Decker, E.S.P.S., Secretary, Manager, Chicago Regional Office.

At a recent meeting of the Chicago Board, O. W. Eshbach, Dean of the Northwestern University Technological Institute, was elected chairman and Joseph R. Decker, manager of the Chicago Regional Office, E.S.P.S., for the 1948-49 term.

Dean Eshbach, representing A.I.E.E. said: "There is need for an aggressive approach to the problem of stimulating interest in, and encouraging the use of E.S.P.S. employment facilities among engineers and employers of engineers."

The committee announced a program of activity which would include the channelling of information to chapters, sections, committees, societies and institutes or other engineering organizations.

Mr. John F. Seifried, representing the A.S.C.E., said: "At every meeting of engineers, the secretary should announce the employment service available through E.S.P.S."

Mr. J. N. Stanbery, representing W.S.E., urges local engineering groups to help extend the use of the personnel service by mention-

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Donald H. Maxwell

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ing it in every mailed publication, by inviting the Chicago manager or members of the Board to meetings, and by requesting articles for publication and distribution to members.

Mr. C. C. Austin, representing the A.S.M.E., asserted that while jobs are available, sufficient numbers of engineers are not registered for service and do not call at the new E.S.P.S. office, Room 501, 84 E. Randolph Street to inspect the published listings of hundreds of positions in the Chicago, New York, Detroit, San Francisco, Boston and Philadelphia area. He also explained that fees for placement of engineers are lower than commercial agency fees. It is his contention that engineers and engineering firms are probably not completely aware of the service offered. He said: "All engineers should be interested in the E.S.P.S. and should avail themselves of the service." No charge for registration is made to either employer or applicant.

Mr. Decker, representing E.S.P.S. said: "It is heartening to encounter the fine spirit of co-operation shown by the Chicago Advisory Committee. All engineering groups are invited to assist in extending this, their own service. We are an engineering service organization for all engineers and employers of engineers and the participation of individuals and organizations is necessary to assure a continually improving, stable and reliable service. I urge both the employing companies and the individual engineer to make use of this non-profit personnel service, operated by engineers and for engineers."

Your local manager will be glad to attend chapter meetings, executive board meetings or other meetings of engineering groups for the purpose of advancing the use of the service. Personnel offices and representatives of employing companies or organizations are invited and urged to inspect the facilities, experience records of engineers registered, and to consult with committee members or the Chicago Manager for assistance. The Chicago office of E.S.P.S., Room 501, 84 E. Randolph Street, STate 2-2748 should be the point of contact



Engineering societies personnel service reception and work room.

## E.S.P.S. Lists Officers

At the first regular 1948-49 meeting of the Chicago Advisory Committee, E.S.P.S. held in the societies' new offices, 84 E. Randolph St., the following officers were elected: Chairman: Ovid W. Eshbach, Dean,

Northwestern Technological Institute, representing the A.I.E.E.

Secretary: Joseph R. Decker, Manager, Chicago Regional Office, representing E.S.P.S.

Committee Members: John F. Seifried, District Manager, Ceco Steel Products Company, representing A.S.C.E.

J. N. Stanbery, Vice President, Illinois Bell Telephone Co., representing W.S.E.

for all engineering employment activity in fourteen Midwestern states.

C. C. Austin, Divisional General Manager, Goodman Mfg. Co., representing A.S.M.E.

W. S. Lienhardt, Metal and Thermit Company, representing A.I.M.M.E.

Dean Eshbach announced a vigorous campaign through local engineering chapters and sections to extend the activities of this non-profit engineering service organization to all engineers and employers of engineers in the Chicago regional office area.

The real test of an educational institution lies in the kind of educated persons that it sends out and their contribution to the life and work of their day.

—Martin, The Meaning of a Liberal Education

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## A.S.T.M. Schedules Date With W.S.E.

American Society for Testing Materials has scheduled a joint meeting with Western Society of Engineers, on Tuesday, October 19, at 7:30 p.m., in the large auditorium of the Western Society headquarters.

Mr. R. L. Templin, president of the American Society for Testing Materials, will speak on the subject, "Aluminum." This will be followed by short talks by a representative of the A.S.T.M. national office, and a representative of Western Society.

Mr. G. E. Stryker, secretary of the Chicago District Committee A.S.T.M., has promised a very interesting evening.

### Personal

Dr. Walter H. Voskuil, mineral economist, State Geological Survey, has been appointed professor of mineral economics at the University of Illinois, Urbana, and will teach part-time in the University Department of Mining and Metallurgy. Professor Harold L. Walker, head of the department, announced today. Dr. Voskuil will continue his work with the survey.

## Letters to the Editor



We've received a lot of phone calls about *MIDWEST ENGINEER*, saying that the caller felt that the entire magazine was a step forward in the progress of the Society. Constructive criticism has also been received on the phone.

We reproduce opposite excerpts of some of the letters we have received and we invite your correspondence to this column.

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**National Door Manufacturers Association  
332 South Michigan Avenue  
Chicago 4, Illinois**

"Thank you for sending us a copy of Volume 1, No. 1 of "MIDWEST ENGINEER" dated September, 1948. We have read this magazine with considerable interest. . . ."

O. C. Lance  
Secretary-Manager

\*

**United States Brewers Foundation Inc.  
21 East Fortieth Street, New York 16, N. Y.**

September 13, 1948

"I am deeply grateful to you for sending me the September issue of the MIDWEST ENGINEER with reprint of the splendid talk which you made at the National Institute and which is going to be so helpful to us in the United States Brewers Foundation."

I note that the September issue is Volume I, No. 1, of the MIDWEST ENGINEER. May I extend my hearty congratulations to you on the establishment of an association publication and my very good wishes for the success which I know it will enjoy. . . ."

Evan E. Steger  
Assistant Secretary

*Editor's Note: No relationship.*

\*

**The Chesapeake and Ohio Railway Company  
4500 Chrysler Building  
New York 17, N. Y.**

September 15, 1948

"Thank you for letting us see your interesting new magazine MIDWEST ENGINEER. I am not an engineer but I enjoyed looking it over."

My best wishes accompany your new venture. . . ."

Howard Skidmore  
Assistant Director of  
Public Relations

\*

**University of Illinois  
Chicago Undergraduate Division**

September 14, 1948

"I have read a copy of your splendid new magazine, MIDWEST ENGINEER. It already has proved interesting enough to make me look forward to the next issue. . . ."

Donald F. Hermann  
Public Relations Office

\*

**Engineering Societies Personnel Service  
84 E. Randolph Street**

"Well Done — MIDWEST ENGINEER!" This traditional Navy praise has been earned by the staff and committee.

The launching of this first rate and thoroughly enjoyable engineering publication is another "service to the engineering profession" by the Western Society.

May you enjoy fair weather, smooth sailing and a good voyage."

Joseph R. Decker  
Manager

**The American Pulp and Paper Mill Superintendents Association, Inc.**

Office of Associate  
Secretary-Treasurer  
38 South Dearborn St.  
Chicago 3, Ill.

"May I take this very first opportunity of thanking Mr. George Baldwin and you for your kindness in supplying me with a copy of your Volume 1, Number 1 issue of MIDWEST ENGINEER. The copy arrived several days ago while I was absent from the office on Association matters.

Now I am back at my desk and want to go over the publication carefully just as soon as I can. A casual glance through its pages however indicates that the publication is unusually attractive and I feel will serve a very definite place in the Chicago area. . . ."

Harry E. Western  
Associate Secretary-Treasurer

\*

**Illinois Road Builders Association  
228 North La Salle Street  
Chicago 1, Illinois**

September 20, 1948

"Thank you for your invitation to contribute an article to your new magazine MIDWEST ENGINEER, which incidentally, I think is one of the finest in the field, and which in my opinion will go far in increasing the further utility of the Society. . . ."

Taylor G. Soper  
Executive Secretary

\*

"Congratulations on the first issue of the MIDWEST ENGINEER!"

Herman H.

\*

**P. J. Herold  
Architect  
455 Hyde Street, San Francisco 9, Calif.**

"The MIDWEST ENGINEER has been received and it is a good publication. This magazine will keep its readers in touch with progress, without a doubt.

The fine article by Mr. W. V. Kahler to young engineers, showing the right path to follow in the early walks of life, is an outstanding one and can be read by any one to their advantage."

P. J. Herold

\*

**Syracuse University  
College of Business Administration  
Syracuse 10, N. Y.**

September 17, 1948

"I have received No. 1 of Volume I of the MIDWEST ENGINEER and congratulate you on starting something very good.

I trust that this initial issue will be the forerunner of a multitude which will redound to your credit. . . ."

W. O. Munroe, Lecturer  
Department of Production

# *Product Appeal*

Your ad in this space will reach 3000 engineers, architects and others interested in scientific fields. They represent the various markets embraced by over 700 companies in the Chicagoland area. They include not only the engineers charged with recommending and ordering equipment and services, but top management levels as well. AND their families read MIDWEST ENGINEER too!

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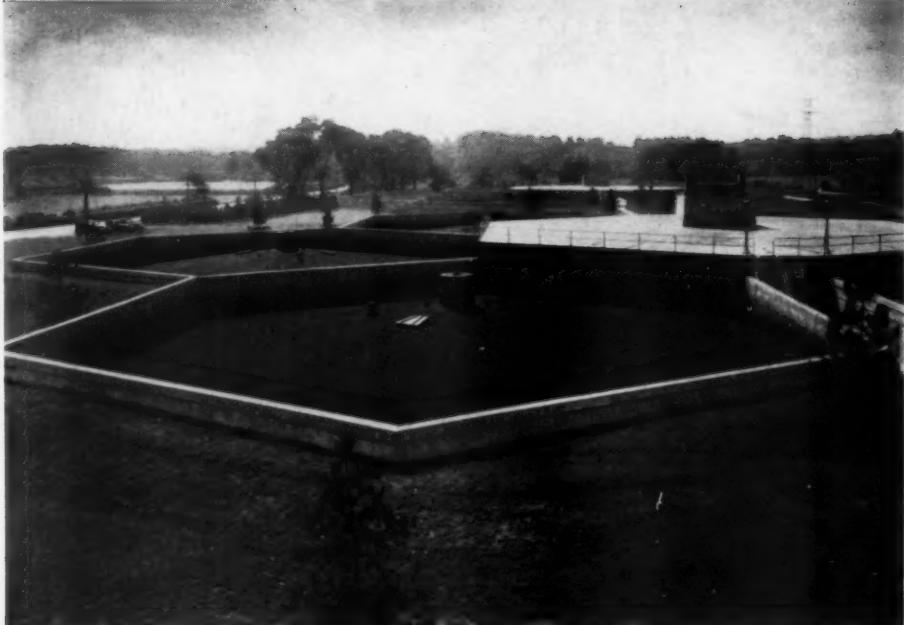
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